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NEW SOUTH WALES

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AS AT 30th JUNE, 1961

DEPARTMENT OF AGRICULTURE*

Deputy Premier and Minister for Agriculture	Hon. J. B. Renshaw, M.L.A.
Under Secretary	Mr. E. O. Tout.
Assistant Under Secretary	Mr. G. Edgar.
Director of Agriculture	Dr. H. J. Hynes.
Accountant	H. J. Chardon.
Chief Clerk	S. W. Wise.
Personnel Officer	C. B. Campbell.
Pastures Protection Officer	E. J. Power.
Legal Officer	J. L. Hager.
Architect	H. A. Browne.
Chief Biometrician	F. C. McCleery.
Chief Research Liaison Officer	Dr. S. L. Macindoe.
Division of Plant Industry—	
Chief	W. H. G. Poggendorff.
Deputy Chief	A. C. Orman.
Principal Agronomist (Pastures)	C. K. Vears.
Principal Agronomist (Research)	N. S. Shirlow.
Principal Agronomist (Extension)	G. Nicholson.
Division of Horticulture—	
Chief	H. W. Eastwood.
Deputy Chief	J. A. Ballantyne.
Principal Fruit Officer (Extension)	R. G. S. Kebby.
Principal Fruit Officer (Research)	B. O. French.
Senior Inspector (Export and Import Branch)	L. T. Bilbe.
Division of Animal Industry—	
Chief	R. M. Watts.
Deputy Chief	R. A. Hall.
Director of Veterinary Research	J. C. Keast.
Principal Veterinary Research Officer	E. J. H. McBarron.
Chairman, Board of Tick Control	J. N. Henry.
Principal Veterinary Officer	N. K. Golding.
Principal Veterinary Officer (Meat Inspection)	Vacant.
Principal Livestock Officer (Sheep and Wool)	C. J. Hawkins.
Principal Livestock Officer (Beef Cattle, Horses and Goats)	W. J. B. Murphy.
Principal Livestock Officer (Pigs)	G. M. D. Carse.
Principal Livestock Officer (Poultry)	V. H. M. Brann.
Principal Livestock Officer (Apiculture)	A. A. Clemson.
Division of Dairying—	
Chief	A. C. Small.
Deputy Chief	I. W. Scott.
Principal Dairy Officer	J. D. L. McGibbon.
Principal Dairy Officer (Herd Improvement)	F. A. Vernon.
Division of Science Services—	
Chief	Dr. C. J. P. Magee.
Chief Biologist	W. S. Sutton.
Chief Entomologist	S. L. Allman.
Chief Chemist	T. H. Johns.
Director of the Royal Botanic Gardens and National Herbarium and Chief Botanist	R. H. Anderson.
Division of Information Services—	
Chief	H. Parry Brown.
Editor of Publications	R. J. K. Synnott.
Organiser, Agricultural Bureau	J. J. Slater.
Senior Extension Officer (Women's Service)	Miss N. M. Foskett.
Division of Marketing and Agricultural Economics—	
Chief	C. J. King.
Principal Economics Research Officer	P. C. Druce.

As at 30th June, 1961

Department of Agriculture—*continued*

Regional Extension Services—	
Chief	J. L. GREEN.
Regional Supervisors of Agriculture—	
Southern Region	R. C. MADSEN.
North Coast Region	S. R. BALLARD.
Western Region	B. D. AMENT.
South Coast and Tablelands	R. W. SHELLEY.
South-Western Region	G. A. CRAWFORD.
Northern Region	G. R. GODDEN.
Mid-Coast and Hunter Region	E. C. CONNOR.
Mid-Western Region	F. J. NICHOLSON.
North-Western Region	J. A. O'REILLY.
Hawkesbury Agricultural College—	
Principal	H. R. RICHARDSON.
Deputy Principal	W. MCCARROL.
Farm Supervisor	T. ADAMS.
Wagga Agricultural College and Experiment Station—	
Principal	B. DOMAN.
Farm Supervisor	J. G. BALLANTYNE.
Wagga Agricultural Research Institute—	
Director	Dr. A. T. PUGSLEY.

Experiment Farms and Research Stations—		
Chief, Experiment Farms and Stations Branch		A. PEARSON.
Bathurst Experiment Farm	Manager	C. H. MORT.
Condobolin Experiment Farm	Manager	J. C. ENGLAND.
Cowra Experiment Farm	Manager	J. M. ARTHUR.
Glenfield Veterinary Research Station	Director	J. C. KEAST.
Grafton Experiment Farm	Manager	C. E. COLLINS.
Griffith Viticultural Nursery	Superintendent	Vacant.
Leeton Experiment Farm	Manager	C. R. HOOD.
Lower Murray Research Station, Dareton	Manager	F. S. OLDHAM.
Narrabri Experiment Farm	Manager	K. F. FLEMONS.
Narara Citrus Experiment Station	Manager	L. F. MANDELSON.
New England Agricultural Research Station	Manager	E. TINDALE.
Poultry Research Station, Seven Hills	Manager	D. C. DUNCAN.
Tamworth Agricultural Research Station	Manager	J. A. LOVERIDGE
Tamworth Agricultural Research Station	Director of Research	Dr. W. V. SINGLE.
Temora Experiment Farm	Manager	R. THOMSON.
Trangie Agricultural Research Station	Manager	J. H. BALLARD.
Wollongbar Agricultural Research Station	Manager	F. A. YORK.
Yanco Agricultural Research Station	Manager	F. D. MACKENZIE.
Alstonville Tropical Fruit Research Station	Manager	D. S. LEIGH.
Dairy Industry Research (North Coast)	Supervisor	W. J. C. HUDSON.

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* For details of staff of the various Divisions and Branches see New South Wales Department of Agriculture brochure " Directory of Officers ".

For staff number totals see tabulation in this Report, page 22.

NEW SOUTH WALES

DEPARTMENT OF AGRICULTURE

Report of the Under Secretary to the Minister for the Year ended 30th June, 1961

Department of Agriculture,
Sydney, 18th October, 1961.

Dear Sir,

Herewith the Report of the Department of Agriculture for the year ended 30th June, 1961.

NOTES FROM CENTRAL ADMINISTRATION

Production Trends

Rural production, on the whole, was well above average and in many cases higher than in the favourable 1959-60 season.

The Seasons.—Conditions were generally dry at the outset of the twelve months from July, 1960, but the pastoral position improved after widespread moderate to heavy rain at the beginning of July. A favourable winter and spring were experienced by all areas except the north coast, sections of the north central plain, and the Western Division. These areas were dry to very dry until the end of 1960.

Heavy rain in most parts of the State in January, 1961, was followed by heat until well into February, and pastures dried off in most areas. March rains improved pastures in most areas.

Over the remainder of the autumn, and June, the position remained satisfactory in central and southern districts, but in many northern and western areas dry conditions set in. At the end of June, 1961, soaking rain was needed in these localities.

Water supplies were adequate in most districts throughout the twelve months and livestock were in fair to good condition. Sheep and cattle in some of the least favoured areas showed dry season effects at the end of June, 1961.

Commodity Notes

Livestock.—At the end of March, 1961, sheep numbers in New South Wales were 68.09 million, a decrease of 2.91 million on the previous year's record of 71.00 million head. Lambing results in most districts were about normal.

Cattle numbers rose from 3.841 million head at the end of March, 1690, to 4.242 million in March, 1961. This increase comprised mostly beef cattle. Their numbers reached a record total of 2.961 million.

Production of mutton and lamb was somewhat higher than in 1959-60, but output of beef and veal showed a marked decline. Production of pigmeats was slightly greater than in the previous year.

Butter production was 33,996 tons; 18 per cent. higher than in 1959-60. Production of cheese was 5,296 tons, the highest on record and 22 per cent. greater than in 1959-60. Milk production in the Whole-Milk Zone was maintained at about the same level as in the previous year.

Egg production was a record, 62.15 million dozen, considerably above the 1959-60 production of 53.50 million dozen.

Crops.—It was another excellent season for cereal crops. The wheat grain harvest of 84,657 million bushels was the second largest on record, and the yield average of 20.8 bushels per acre was well above normal. Production was considerably higher than in 1959-60 when 75.36 million bushels of grain were harvested.

Of 4.277 million acres sown to wheat for all purposes, 4.076 million acres were harvested for grain, 101,000 acres were harvested for hay, and 99,500 acres were used for green fodder. Production of wheaten hay in 1960-61 was 154,000 tons.

An anticipated heavy carry-over of wheat from the 1960-61 crop did not eventuate due to substantial, unexpected sales of wheat to mainland China.

The oat harvest of 21.56 million bushels was one of the largest on record, and considerably greater than the 1959-60 production of 11.13 million bushels. Of 1.570 million acres sown for all purposes 917.5 thousand acres were harvested for grain, 98.0 thousand acres for hay, and 554.7 thousand acres were used for green fodder.

Barley production and acreage were records. The barley grain harvest of 4.79 million bushels was almost 2 million bushels above the previous record production of 2.92 million bushels in 1958-59. The total area under crop was 211.26 thousand acres. Of this area, 189.41 thousand acres were harvested for grain at yield average of 25.3 bushels per acre.

The maize harvest of 2.23 million bushels, was about normal.

Rice production was approximately 112,500 tons, 13,500 tons below the 1959-60 season's record of 126,000 tons. Yield average was 2.44 tons per acre, slightly less than the record yield of 2.55 tons per acre in the previous season.

Citrus crops were light and production was 3.67 million bushels; considerably less than the previous year's record of 4.72 million bushels. The 1961-62 citrus crop is expected to be somewhat above average.

Expenditure—Summary

Payments from Consolidated Revenue Fund relating to investigational, educational and associated administrative activities totalled £2,864,552. Receipts from sales of farm produce and from fees and other miscellaneous revenue, totalling £694,418, reduced the net cost to £2,170,134.

Cattle tick control cost £1,017,387 (net) after allowing for stock-dipping fees and other minor items of revenue totalling £9,535. The Commonwealth Government has contributed £521,388 towards the costs, leaving £495,999 to be borne by New South Wales.

Royal Botanic Gardens and Allied Activities accounted for a further sum of £131,864, offset by receipts totalling £12,151, leaving a net cost of £119,713, to the Consolidated Revenue Fund.

Buildings and improvements of a permanent nature to a total cost of £118,204 were constructed. This was provided from loan funds.

Details of the accounts of the department, including numerous Special Deposits Accounts, opened with the Treasury in terms of the Special Deposits Act of 1911, are presented in Appendix I.

Capital Works

The department has in hand, for completion in 1961-62, capital works such as buildings, irrigation development, water supply, &c., estimated to cost £170,000.

Commonwealth Agricultural Extension Grant

This grant, to enhance extension services and their effect, will continue until 30th June, 1965. Since its inception in 1952-53, this State has received amounts varying from

£50,000 to £75,000 per annum. As from 1st July, 1960, the total grant to the States has been fixed at £300,000 per annum, of which New South Wales will receive £75,000 annually.

Examples of the effects of this grant are provided in other sections of this Report.

Commonwealth Dairy Industry Extension Grant

This grant, from which £64,880 is received annually by New South Wales to enhance extension services and their effect on the dairy industry, is to continue to 30th June, 1963, when it may be renewed for a further period.

Examples of the effects of this grant are included in other sections of this Report.

Industry Research Funds

Funds at the rate of £3,400,000 a year are now available from the various Commonwealth-subsidised primary industry levy schemes—mainly for research, but to some extent for extension work—throughout Australia. These funds are having a major effect on work done by the State Departments of Agriculture, the C.S.I.R.O., and universities.

Importantly, this Department has to be equipped and ready to expand its research programmes to effectively serve the respective primary industry.

The industry funds are allocated by committees.

Wool Research Committee Funds.—The income of this fund is made up of 2s. per bale from growers and 4s. per bale from the Commonwealth. For the year 1960-61 it allocated a total of £2,268,024. The C.S.I.R.O. received by far the greater part of it. The Department's allocation has been increased from £8,740 in 1960-61 to £19,603 in 1961-62. The 1961-62 allocation included £8,000 to assist in the re-establishment of Shannon Vale Nutrition Station.

In earlier years the Wool Research Committee gave little support to State Departments of Agriculture extension functions. More recently it has realised that to reduce the lag in research results reaching the farmer, funds should be spent also on extension. As a result of an agreement made with the Wool Research Committee, this State has been able to appoint three officers with salaries from Wool Funds for a period of three years, on the understanding that subject to satisfactory service they will be absorbed into the State service. The three livestock officers (sheep and wool) have been appointed, respectively to Wentworth, Broken Hill and Brewarrina Districts.

Wheat Industry Research Committee Funds.—Under the Wheat Tax Act wheat growers are levied a farthing a bushel on all wheat delivered to the Australian Wheat Board. Wheat tax collections are paid into the Wheat Industry Research Trust Account and become available for wheat research programmes approved by the respective State Wheat Industry Research *Committee.*

Commonwealth contributions are provided for, up to a maximum of £ for £ against wheat-tax collections, and are available for expenditure on research programmes recommended by the Wheat Industry Research *Council* (Federal level) and approved by the Minister for Primary Industry.

From the Wheat Industry Research Committee, the N.S.W. Department of Agriculture received £15,820 in 1960-61. This has been increased to £20,345 for 1961-62.

Wheat Industry Research Council Funds.—The 1960-61 allocation was £5,800, increased to £11,550 for 1961-62. The latter includes a contribution of £8,000 as a capital grant towards additions to the Agricultural Research Institute, Wagga. The Department would hope also to receive a reasonable proportion of the funds specially budgetted by the Council for skeleton weed research.

Dairy Research Committee Funds.—Under the Dairy Produce Levy Act a levy of 1/16d. per pound of butter, and 1/32d. per pound of cheese is paid by dairy farmers on all butter and cheese produced in Australia. The Commonwealth makes a contribution of half the expenditure on projects approved by the Minister, with a maximum contribution on a £ for £ basis against funds raised by the levy.

The following amounts have been allocated to New South Wales (about one-third being for dairy manufacturing research and the remaining two-thirds for dairy farm and socio-economic research):—In 1960-61, £20,835; and for 1961-62, £24,097.

As the result of these funds there has been a substantial stepping up of pasture, animal husbandry, and socio-economic research, centred on Wollongbar Agricultural Research Station.

The Department has appointed a Supervisor of Dairy Industry Research for the north coast, with salary from the dairy industry research funds.

Also, at Hawkesbury Agricultural College, a programme of research into the manufacture of blue vein cheese has been set up with the help of industry funds.

Tobacco Advisory Committee Funds.—The Tobacco Industry Trust Account was created by legislation which came into operation in January, 1956. Revenue comes to it from growers and manufacturers and from the Commonwealth and State Governments.

In 1960-61, New South Wales was allocated £50,660. A substantial part of this was a contribution towards the establishment of a new Tobacco Research Station. So far, a suitable site has not been available.

The 1961-62 allocation is £70,100. This again includes initial establishment costs of a Tobacco Research Station.

The Department has recently had great success in the breeding of blue mould resistant varieties of tobacco.

Cattle and Beef Research Committee Funds.—Commonwealth legislation provides for a statutory levy of a maximum of 2s. per head of cattle slaughtered for human consumption, and provision is made for the Commonwealth Government to contribute on a £ for £ basis.

The Committee's activities have been delayed by complications in the method of implementing the levy. It is anticipated that the difficulties will shortly be overcome. Meantime the Department has submitted comprehensive plans for a number of research projects aimed at improvements in the beef industry in this State.

Study of Implications and Effects of Industry—allocation of Research Funds

A research officer of the Department's Division of Marketing and Agricultural Economics has been allocated to a study of the implications and effects of funds available by way of industry levies for research.

The levy monies, together with the £ for £ contribution of public monies by the Commonwealth, have grown to be a considerable part of the total funds available for agricultural research within Australia.

Criteria and mechanisms used by fund-controllers in allocating the money would seem likely to have a significant effect on research itself—the directions of research, where and by whom and how it shall be done; by new establishments or by already-developed units; and so on.

United Nations Food and Agriculture Organization

The State FAO Committee continued to maintain close liaison with the National FAO Committee and, through it, with headquarters of the United Nations Food and Agricultural Organization in Rome.

The Department has continued to support the FAO's Expanded Technical Programme of Assistance to underdeveloped countries, by assisting with the training of visiting agricultural students and government officers.

Australian Agricultural Council and Standing Committee on Agriculture

The Australian Agricultural Council met on three occasions—July, 1960 (Darwin), February, 1961 (Canberra) and June, 1961 (Adelaide). Four meetings of the Standing Committee on Agriculture were held—three as above and the other in November, 1960, at Melbourne.

Items discussed included fruit fly research; contagious bovine pleuro pneumonia control and eradication; co-ordination of agricultural research; diagnosis of exotic animal diseases; skeleton weed control; marketing of wheat, tobacco, cotton, honey and egg pulp; and commercial breeding of rabbits.

Cotton Variety Trials at Yanco

Narrabri Experiment Farm, in the north-west, is a major site of the Department's cotton research ; but about 2,000 acres of commercial cotton are now sown in the south-west, and the Yanco Agricultural Station's cotton work helps to serve this area.

Royal Botanic Gardens and Government Domain Trust

Three meetings of the Trust were held. Matters discussed included the leases of the Gardens and Domain kiosks; a proposal for construction of a replica of H.M.S. *Sirius* in Farm Cove, and for erection of a memorial to Sir Leslie Morshead at the new entrance to the Gardens.

The Honourable R. B. Nott, M.L.A., resigned from the Trust following his appointment as Administrator of the Northern Territory.

Farrer Memorial Trust

The Trustees of the Farrer Memorial Research Scholarship Fund held an annual and one ordinary meeting.

With deep regret, the death of Mr. Alexander McCorquodale on 26th November, 1960, is reported. The late Mr. McCorquodale served as a Trustee for over seventeen years.

The Annual Farrer Memorial Oration for 1960 was delivered by Mr. H. J. Geddes, M.Agr.Sc.(N.Z.), Director of the University of Sydney Animal Husbandry Farms, Camden, and Garland Senior Lecturer in Animal Husbandry, University of Sydney, during a special session of the Agricultural Bureau State Congress at Hawkesbury Agricultural College on 12th July, 1960. Subject of the Oration was "The Storage and Utilisation of Irrigation Water on the Individual Holding". The text was subsequently published in the *Agricultural Gazette of N.S.W.*

Mr. Geddes was presented with the 1960 Farrer Memorial Medal in recognition of his distinguished service in agricultural science.

The accounts of the Trust have been audited and found satisfactory by the Auditor-General of New South Wales.

The Farrer Memorial Research Scholarship held by Mr. P. W. Ellyard, B.Sc.Agr., Soil Chemist, New South Wales Department of Agriculture, was extended for a further period of twelve months from 3rd January, 1961.

McGarvie Smith Institute Trust

In accordance with the McGarvie Smith Institute Incorporation Act, 1928, profits from the sale of vaccines produced at the Institute are applied to the promotion and advancement of veterinary education and research. Trading resulted in a profit of £2,027 this year.

Country Office Accommodation

Improvements have been effected wherever possible. The needs have been under constant attention, in the interests of the staff and the public.

New or expanded office accommodation has been provided this year at Casino, Cooma, Cootamundra, Dubbo, Grafton, Nowra, Parkes and Tamworth.

Negotiations are proceeding for improved or additional accommodation at Broken Hill, Leeton, Moree and Young. Plans are well advanced for new Government Offices at Coffs Harbour and Cowra, and for a building to be constructed by the Milk Board at Taree, where Department of Agriculture officers will be amongst those accommodated.

Agricultural and Veterinary Science Trainees or Cadets

Fifty-six trainees and cadets were enrolled for the 1961 academic year; twenty-five more than for 1960. The trainees are undertaking courses at the University of Sydney, University of New South Wales, or University of New England; and the cadets are at Hawkesbury or Wagga Agricultural College.

Rydalmere—Division of Science Services Laboratories

The new laboratories block at Rydalmere for Division of Science Services has been completed and equipped—at an overall expenditure of near to £550,000.

Biology Branch, Entomology Branch, and Chemistry Branch, all previously accommodated at Head Office, in Farrer Place, Sydney, are now in occupation at Rydalmere.

Tamworth Agricultural Research Station Programme

In 1959, development of Tamworth Agricultural Research Station was intensified to increase its effectiveness as a research centre.

In the period 1959-61, approximately £64,000 has been spent there; to provide an administrative and laboratory building, glass house, machinery shed, birdproof enclosures, amenities, roads and fences. A further £13,000 was spent on furnishings, farming plant, and laboratory equipment.

Dr. W. V. Single, B.Sc.Agr., Ph.D., was appointed Director of Research and has assumed his duties. The research staff has been expanded. Three additional agronomists commenced duty. Positions for a plant pathologist and an analyst have been approved.

Wheat production problems will be the most important activity of the Station in the first instance: with special attention to rust resistance in wheat, cold resistance in wheat, and producion of wheat of better baking quality.

Frost damage in north-western wheat crops has been one of the most serious problems. Cold resistance and phasic development studies in wheat improvement will be an important feature of the Station's research work.

Fertilizer requirements of northern soils will be investigated more closely than in the past. Chemical laboratories at the Station will enable studies on protein content, and the association of soil fertility with wheat quality.

In the north-west, suitable pasture species for rotation with wheat are limited. This field of investigation requires attention, and the Station is now equipped for it.

Oats is an important grain and grazing crop in the north-west. Attempts to improve oat varieties for use there will now be intensified.

The agronomy research will also include linseed, safflower, grain sorghum, sorghum almum, sudan grass, summer legumes and other crops.

Later, livestock investigations will be undertaken—more particularly with sheep—but cattle will also be included in the work of the Station.

Agricultural Education Committee
(Recommendations Concerning the Agricultural Colleges)

In May, 1960, the Public Service Board, after consideration of documents prepared by the Department in regard to courses of instruction for the diplomas at the Hawkesbury and Wagga Agricultural Colleges, appointed a committee to look generally at the various educational services provided in the Colleges and to make recommendations as to changes thought desirable.

The committee comprised Mr. H. F. Heath, B.A., B.Ec., Member of the Public Service Board (Chairman), Dr. H. J. Hynes, D.Sc.Agr., M.Sc.(Minn.), Director of Agriculture, and Mr. W. W. Jones, B.Sc.Agr., Staff Inspector, Department of Education, and Mr. J. W. Edwards, from the office of the Public Service Board, as Secretary.

The Report of the Committee was issued in February, 1961, and in March, following tabling in the Legislative Assembly, was ordered to be printed.

The Report contains a number of recommendations, including:—

(1) Establishment of an Advisory Committee to assist the Principals of the Agricultural Colleges in designing courses of study.

(2) For the Diploma in Agriculture, raising of the entrance standard to Leaving Certificate level.

(3) Raising the standard of instruction for the Diploma to ensure that the successful diplomate has a deeper background of basic scientific knowledge, as well as competency in best farming practices.

(4) Establishment of a Farm Certificate Course of one year's duration at each College. This course would cover farming practices generally, with some provision for industry specialisation.

(5) Introduction of a three-term year at each College, instead of the present two-semester system.

(6) Secondment of lecturers from the Departments of Education and Technical Education in cases where the Department of Agriculture itself is unable to meet the requirements.

(7) In-service training courses for the staff at each College.

The most important feature was the recommendation to lift the standard of the Diploma Course, and at the same time to provide a full year's training (Farm Certificate course) in the practical skills of farming for boys who plan to make a career on the land and do not wish to devote three years' study as required of a Diploma course.

The recommendations are being considered by the Minister.

Fruit Fly Male-lure System of Control

Use of a special male-attractant, to annihilate fruit fly males before they were old enough to mate, was tried in whole-district pilot areas. The results were promising in relation to early fruit. The method, preferably started in autumn, appears specially promising for isolated areas. Even in other areas it would usefully supplement widespread conventional baiting. (There is considerable detail of this project in the Entomology Branch section of this Report.)

Argentine Ant Eradication Unit

Enabling legislation is being prepared to set up a special unit to finalise the Argentine Ant Eradication project in Sydney. During the period 1952-9, some 4,000 acres have been sprayed at a cost of £100,000 and the results have been exceptionally good. At the present time thirty unsprayed infestations totalling 850 acres remain to be treated.

Substantial Progress in Fruit Fly Control

Continued success has been achieved in the use of modern pre-harvest fruit sprays.

An experiment in the conduct of whole-town treatments as an organised service yielded encouraging results. Two towns so treated this year have recorded complete freedom from fruit fly attack. Further demonstrations of these methods have been designed for 1961-62. They have been made possible by the co-operation of local government bodies and interested local organisations prepared to finance and implement the programme of treatments under departmental guidance and supervision.

Experiences from these investigations should provide a firm basis on which to evaluate the efficiency and economics of organised town-treatments as a practical future course of action.

Studies of commodity treatments of citrus fruits by fumigation have been successful. The New Zealand Government has now accepted the particular treatment as satisfactory in respect of citrus exports from New South Wales to New Zealand. This has reopened a valuable export market which was long closed because of fruit fly.

A commodity treatment for dis-infestation of bananas has also been studied, with encouraging results.

(There is more detail of these matters in the Division of Science Services, Entomology Branch, and Division of Horticulture sections of this Report.)

Milking Machine Efficiency Survey

Five Milking Machine Survey officers are now operating. Their work has been of outstanding value to farmers, and the service is under very heavy pressure of requests from farmers for attention.

A survey of relationship between milking machine efficiency and mastitis has been initiated. It has become apparent that use of antibiotics is masking the relationship. In the coming year, expansion of the survey on an amended basis will be explored.

Milk "Solids-Not-Fat" Project

Attention has been drawn to the human diet importance of solids-not-fat in milk; and their apparent deficiency in some milk supplies.

To ascertain factors that influence the low solids-not-fat content of milk under some New South Wales conditions, two special recording units have been established. Each unit comprises 28 herds, and near to 2,000 cows.

Information from this project will help towards remedial measures.

Swine Fever

Swine Fever was diagnosed as the cause of pig mortalities in the Counties of Cumberland and Northumberland. This was the first outbreak in Australia since 1943.

The strain of virus found to be present is of comparatively low virulence. This had led to difficulties and delay in making positive diagnoses.

Quarantine areas embracing the County of Cumberland and the whole of the Maitland Pastures Protection District were established. An embargo was placed on movement of pigs and pigmeats from within the quarantine areas to any destination outside them. Strict control was exercised over the movement of pigs within the quarantine areas; and frequent, regular inspections were made of all piggeries.

During the period from May, 1961, when the disease was first diagnosed, to 30th June, 1961, 26 piggeries (involving 5,300 pigs) were found to be affected by swine fever.

All pigs on affected piggeries were slaughtered. The carcases were destroyed by conversion into fertilizer. No restocking was permitted till the premises had been suitably disinfected and spelled.

Swine Compensation Act

Many claims for compensation were investigated. Appropriate recommendations were made for payment or refusal.

At the beginning of the swine fever outbreak the credit balance of the Compensation Fund was about £95,000. Because the Fund would otherwise be depleted before the outbreak is eradicated, legislation to increase th rate of swine tax from 6d. to 2s. per carcase is pending.

Swine Branding Act

To impress upon pig-raisers their responsibilities under the Swine Branding Act, an effective system of checking on branding was instituted throughout the State—with excellent results.

Cattle Tick Control

Eradication measures were continued in the Rivertree Quarantine Area. This area was divided into two sections by the establishment of a quarantine line. No tick was found in the north-western Rivertree section, but two infestations were detected in the south-eastern section, and this will remain in quarantine for a further period.

In the Grafton Quarantine Area tick infestations were detected in the north-eastern portion. Two Special Areas were created to include this portion, to prevent spread of ticks to the rest of the Quarantine Area. No further infestation was detected in the Clarenza and Lower Southgate Special Areas, or elsewhere in the remainder of the Grafton Quarantine Area. As a result of the detection of infestations in the north-eastern portion, the whole of the Grafton Quarantine Area will be held in quarantine for a further period.

Change-over from arsenic to DDT as an acaricide has been completed. Thus, problems associated with arsenic-resistant ticks have been eliminated.

Site Acquired for Cattle Tick Research Centre

A property of 385 acres at Wollongbar was purchased for the establishment of a Cattle Tick Research Centre. The preparation of this property for use as a Research Station has commenced by the erection of fencing, construction of roads, and modification of existing buildings.

Tuberculosis in Cattle, Eradication Areas

In addition to the one quarantine area gazetted during the preceding year, eight quarantine areas were declared for the purpose of tuberculosis eradication on an area basis.

The total number of cattle involved in all quarantine areas is now approximately 175,000.

The initial tuberculin testing was completed in the Illawarra Quaranine Area and was well under way in five of the new quarantine areas.

Increased Animal Quarantine Work

The volume of work associated with the administration of the Commonwealth Quarantine Act continued to increase, mainly as a result of the great increase in air travel and the number of parcels received from overseas through the Sydney Parcels Post Office.

There was a fivefold increase in the number of horses arriving from the United Kingdom and special precautions were taken with these animals to prevent the possible mechanical introduction of the virus of Foot and Mouth Disease.

Animal Production Research

There was further expansion of research in animal production. A great deal of work is now proceeding in this important field.

Sheep Wool Work.—At the Trangie Agricultural Research Station research was continued into such problems as breeding by selection for clean fleece weight, factors affecting efficiency of wool growth, investigation of a poll gene in Merino sheep, ram fertility, ewe fertility, and artificial insemination in sheep.

At other centres the work includes fixation of the Border Leicester/Merino cross, breed comparison studies, and studies of times of lambing, early weaning, greater stocking and production per acre.

Beef Cattle Work.—Beef cattle research is centred at the Leeton Experiment Farm and included studies on problems associated with breeding and selection, rate of growth, and nutrition.

Poultry Work.—Poultry research is centred at the Seven Hills Poultry Research Station. It includes breeding programmes for egg and meat production, and research into such nutritional problems as the use of soybean meal in diets, limiting amino acids in diets, growth stimulating substances, sodium requirements of laying hens, and pyridoxine deficiency.

(There is more detail in the Division of Animal Industry section of this Report of the Department.)

Long-grained Rice

For the third year in succession, the per acre rice production average of any other country has been surpassed by New South Wales growers (2.44 tons/acres in 1961). However, the production successses have been accompanied by low prices, and the returns to growers have fallen from £39 per ton received four years ago, to the present figure of £25 per ton—an almost uneconomic price.

Foreseeing this possible trend, some years ago the Department commenced an introduction and breeding programme to produce a long-grained variety. This could compete on world markets on more even terms than could the short-grained, principal export variety (Caloro 2) now being grown.

The Department's programme has now produced and released to growers 850 bags of pure seed of an American variety—Bluebonnet 50, a long-grained variety with good cooking qualities. Its yield may not be as high as that of Caloro 2 but its properties in general will ensure easier sale at higher prices on the export market. Growers will not lose and may gain by changing over to Bluebonnet 50.

Meantime, breeding to produce still better long-grains is well advanced.

Cotton Acreage Expanded

Farmers have prepared land and purchased seed sufficient to sow 2,610 acres of commercial cotton in the coming season, a striking increase on the previous area sown to this crop.

In 1960-61, little more than 200 acres of commercial cotton was sown in New South Wales and 150 acres of this total was sown in he Forbes-Jemalong district. The average return was in the vicinity of 1,000 lb. of seed cotton per acre, a praiseworthy effort from growers quite unfamiliar with this plant.

In keeping with the need for intensive research, the Department is pressing forward with cotton investigations at Narrabri Experiment Farm (irrigated). The main hazards foreseen in commercial cotton growing are: weeds, insects, and irrigation economics. Research is being conducted on these problems. In addition, a pure seed scheme has been initiated.

Tobacco Research

Despite loss of two princpal tobacco research workers, the Department continued its tobacco research. A replacement tobacco breeder has been secured and is now stationed at New England Agricultural Research Station. A tobacco pathologist has also been selected and will take up duties shortly. A tobacco research-extension agronomist has also been appointed. This officer will work on tobacco field problems, with Ashford as headquarters.

High prices have been obtained for leaf from trial areas of the Department's mould-resistant crossbreds, but there is a suggestion of buyer prejudice aganst the leaf. No firm decision has yet been made on general release of one of these lines.

Tests by manufacturers are in hand, to resolve the question of whether or not the quality of the leaf is quite as good as that of the standard variety Hicks. In any case, grower losses caused by blue mould warrant release of one of the strains. A limited amount of seed is already being distributed to selected growers.

Nitrogen on South Coast Dairy Pastures

Following reseach plot leads, the research agronomist at Berry has extended the results into the field. On a commercial dairy farm it has been demonstrated conclusively that winter feeding of concentrates may be entirely eliminated—if replaced by high quality winter pasturage produced by use of nitrogenous fertilisers, and without reduction in dairy production. There is, in fact, considerable monetary gain to the farmer.

On the demonstration farm, £200 worth of nitrogenous fertilizer replaced a previous annual average useage of £700 worth of purchased foodstuffs. The cash outlay to produce winter milk was reduced from 8.25 to 2.2 pence per gallon.

Increased Pasture Seed Production

The amount of pasture seed produced in New South Wales markedly increased, particularly seed of *Phalaris tuberosa* and perennial ryegrass. Production of these two (they are normally imported; the first—intermittently, and the second—regularly, in large quantities)surpassed the production of any previous year. Their certified seed totals for the year were in fact more than equal to the previous cumulative total production in this State.

Establishment of a seed certification scheme for the Kangaroo Valley strain of ryegrass was a big factor in the increased local production of ryegrass. The per acre rate of production of this strain reflected the results of research into use of nitrogen fertilizer in grass seed production.

Promising Summer Legumes—Seed Production

Field testing and commercial use of the summer legume species of promise for the north coast have been retarded until now by inadequate seed supplies. A special effort at Grafton Experiment Farm has now produced a reasonable nucleus bulk of *Glycine javanica*, Siratro, *Dolichos lab lab* and *Desmodium uncinatum*. This seed, for further seed increase in 1961-62 should produce sufficient to sow several hundred acres of these pastures in the spring of 1962.

Dairy "Feed Year" Research

At Wollongbar Agricultural Research Station, successful conclusion of the vetch grazing trial, has been followed by a more complex trial—to compare the production of dairy stock fed by paddock grazing of seasonal pastures with that of stock grazed on kikuyu grass alone.

The stock grazed on seasonal pastures are being given, over the whole year, the most satisfactory nutritional plane possible with currently available species. The "feed year" comprises kikuyu grass in the late spring and summer, and *Glycine javanica* in the late summer and autumn; followed by subterranean clover in the autumn and winter, and vetches in the spring.

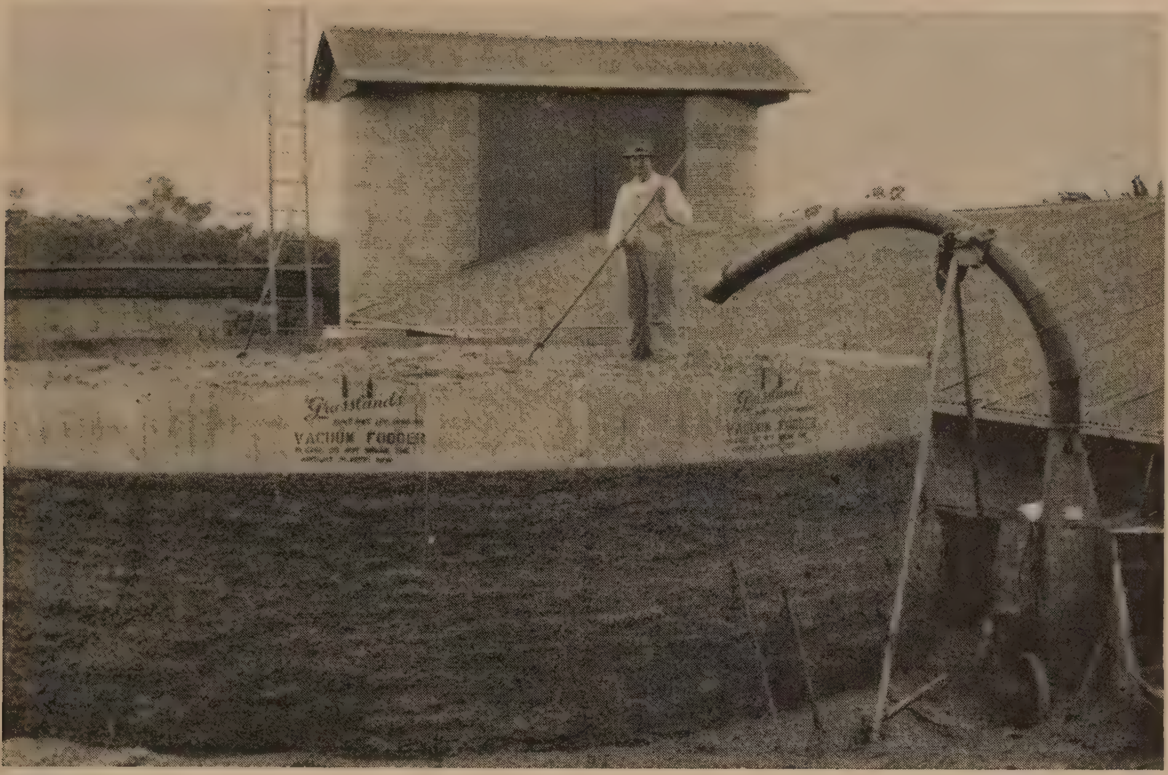
Sorghum almum Certified Seed

Seed of *Sorghum almum* has been produced for the first time in Australia. The scheme, initiated by this Department, has been confined to the Shires of Boomi, Boolooroo, Yallaroi and Namoi (all in the north-west). In this initial year 80 tons of seed were certified for distribution to various States.

Waxy-starch Grains Released

From Grain Sorghum.—Waxy starch from grain sorghum was available to canning firms for the first time; made possible by the Department's introduction, selection, and release of a sorghum variety with waxy starch properties.

All available seed of the waxy sorghum variety was used by Wheat Industries (Aust.) Pty. Ltd., to supply its contract growers in the north-west. The waxy starch manufactured from the season's crop did not fill the company's orders and an expanded 1961-62 acreage has been planned. The company has installed additional machinery for waxy sorghum starch extraction.



Modern Silage-making has Captured Interest

This is a demonstration of vacuum-packed silage making at Cooranbong. The stack (of finely chaffed maize and sweet sorghum) is being built ; with metal collar in position as wall-former. Walking around within the collar causes it to rise ¼ in. to ½ in. at a time. No other compacting is done whilst building the stack up to 10 ft. height. At 10 ft. a plastic cover is applied. The air is then withdrawn by a vacuum pump—causing the silage to compact thoroughly and settle to a 7 ft. height.

From a Maize Hybrid.—A maize hybrid with the same waxy starch properties as the sorghum has also been developed and released by the Department. Robert Harper and Co., Melbourne, have shown interest in the first waxy maize grain produced.

Grain Sorghum Hybrids

Trials of grain sorghum hybrids have been undertaken. The results indicate that some hybrids bred by the Queensland Department of Agriculture and Stock will outyield and eventually replace open pollinated grain sorghum varieties. Thus, a trend similar to that which occurred in maize growing would occur.

The New Wheat Varieties

Falcon in the South.—Arising from the Wheat Improvement programme of the Department's Agricultural Research Institute at Wagga, a new wheat variety bred at Temora Experiment Farm has been named "Falcon"; and seed supplies have been built up by Registered Seed growers.

Falcon combines good field performance and yield with better baking quality than other varieties at present widely grown in southern New South Wales. It has been included in *recommendations for trial plantings* over a wide area in the south.

Mengavi and Gamenya in the North.—First commercial plantings of Mengavi and Gamenya, two new rust resistant varieties produced under the combined northern breeding programme of the Department of Agriculture and the University of Sydney have been made. These two varieties compare favourably with Gabo in yield and baking quality. They are expected to replace Gabo rapidly, particularly because of their resistance to the currently prevalent strains of stem rust.

Winter Wheats, Winglen and Windebri.—Areas sown to winter wheats expanded in 1960, following provisional recommendation of the New South Wales variety Winglen, and the naming of Windebri—a sister line to Winglen. The expansion was at the expense of the only other winter wheat commercially grown in New South Wales.—Winter Minflor.

Macaroni Wheat—Dural.—The new macaroni variety, Dural, produced by this Department's wheat breeders was grown on 8,040 acres in the north-west in 1960. All of the marketable grain commanded a premium from millers.

Advisory Committee on Wheat Production and Marketing

In 1960 the reports of the Commonwealth Wheat Production and Marketing Committees were published at the direction of the Australian Agricultural Council.

In early 1961, the New South Wales Minister for Agriculture established a New South Wales Advisory Committee on Wheat Production and Marketing, to consider, arising from the reports, problems which require special action by New South Wales.

The Committee comprises technical advisers (a specialist in wheat production, and a cereal chemist, from the Department of Agriculture; and the Director of the Bread Research Institute); a representative from the Australian Wheat Board; and the Chairman (the Director of the New South Wales Department of Agriculture). The Committee has met several times, and has consulted representatives of wheat growers' organisations and of millers and bakers—with a view to making firm recommendations later to the Minister.

New Vegetable Varieties Released

New vegetable varieties developed by the Department were named and released. They comprised a potato, a tomato and two bean varieties. Each had been fully tested on farmers' properties as well as at the Department's research institutions. Each had shown to advantage compared with present commercial varieties.

Staff Section

Appointments.—H. J. Cann, Special Fruit Officer; D. E. Maccallum, Economics Research Officer; B. H. Ware, Livestock Officer; B. D. Ferguson, Livestock Officer; J. G. Drever, Agricultural Engineer; R. I. Johnson, Agronomist; C. C. Short, Analyst; A. D. Mears, Extension Officer; C. J. P. Magee, Chief, Division of Science Services; W. S. S. Sutton, Chief Biologist; Miss L. R. Fraser, Senior Biologist; D. G. Lundie-Jenkins, Lecturer; L. W. Beer, Livestock Officer; B. P. Setchell, Special Veterinary Research Officer; D. H. Mumford, District Veterinary Officer; C. S. M. Humphris, Analyst; R. J. Downing, Veterinary Officer; C. D. Throsby, Economics Research Officer; A. J. Beck, Agronomist; H. M. Davidson, Dairy Officer; W. V. Single, Director of Research, Tamworth Agricultural Research Station; C. J. T. Hawkins, Principal Livestock Officer; R. D. Eastoe, Special Livestock Officer; B. Barkus, Analyst; T. O. O'Brien, Agronomist; M. C. Stannard, Fruit Officer; Miss I. N. Cummins, Biometrician, D. G. Fowler, Livertock Officer; E. J. Davis, Dairy Officer; A. Brunskill, Livestock Officer; R. T. Spencer, Special Agronomist; A. M. H. Riddler, Soil Surveyor; W. A. Geering, Veterinary Officer; R. R. Wilkinson, Livestock Officer; R. M. Watts, Chief, Division of Animal Industry and Chief Veterinary Surgeon; K. S. Lysaght, Lecturer; A. C. Nichol, Livestock Officer; J. C. Drake, Veterinary Officer; J. G. Bird, Economics Research Officer; G. F. Donaldson, Economics Research Officer; P. T. McCormick, Veterinary Officer; N. A. Rowlands, Agronomist; Miss M. Vickery, Analyst; R. A. Hall, Deputy Chief, Division of Animal Industry; J. F. Dillon, Editorial Assistant; J. F. J. Titze, Laboratory Technician; J. G. Jeater, Fruit Officer; A. Preobrajensky, Fruit Officer; G. J. Shanahan, Special Entomologist; S. W. Westley-Wise, Chief Clerk.

Retirements.—C. C. Blumer, Chief, Division of Animal Industry; A. K. Cantrill, Principal Livestock Officer (Sheep and Wool); J. C. Cotsell, Livestock Officer (Sheep and Wool); P. J. Baker, Clerk; R. Jarvis, Labourer, Export and Import Branch; D. M. Scott, Foreman, Glenfield Veterinary Research Station; J. J. Gray, Gatekeeper, Queensland Border; W. H. Griffin, Foreman, Royal Botanic Gardens; J. H. Miller, Labourer, Royal Botanic Gardens; P. B. Mackenzie, Inspector, Plant Diseases Act; R. A. Ebbick, Field Assistant; E. H. Myers, Herd Organiser; A. F. Gerathy, Herd Recorder.

Deaths.—G. S. Hardy, Dairy Officer (30-9-60); W. A. Anderson, Foreman, Leeton Experiment Farm (2-10-60); C. N. Kelly, Garden Labourer, Royal Botanic Gardens (4-3-61); C. L. Marshall, Clerk (14-6-61).

Departed for Overseas.—Mr. C. D. Blake, Plant Pathologist, Biology Branch, having been awarded the Sir Benjamin Fuller Trust Scholarship, was granted twelve months' study leave; for research work on plant parasitic nematodes at Rothamsted Experimental Station, England.

Mr. J. R. Syme, Agronomist, Agricultural Research Institute, Wagga, having been awarded the Thomas Lawrence Pawlett Travelling Scholarship, was granted leave for an initial period of twelve months; to study in the United Kingdom pasture utilisation and general plant-animal inter-relationships.

Mr. D. I. Gillies, Dairy Officer, was loaned to the Commonwealth to visit Vietnam for five months; to advise Vietnamese personnel in pasteurization and milk testing and operation of the milk processing plant at the Experimental Dairy Farm (Colombo Plan), Ben Cat.

Mr. J. L. Green, Chief, Regional Extension Services, to attend the 9th International Training Centre on Methods and Programme Planning in Agricultural and Home Economics Extension at Wageningen, The Netherlands, and to visit England, Scotland and West Germany to investigate regional extension and advisory methods.

Returned from Overseas.—Dr. C. J. Magee, Chief, Division of Science Services, attended the Commonwealth Mycological Conference and the Commonwealth Agricultural Bureaux Review Conference and visited research institutions and banana markets in the United Kingdom, Vienna, U.S.A., Hawaii and Manilla.

Mr. C. K. Vears, Principal Agronomist (Pastures), attended the 8th International Grasslands Conference at Reading, United Kingdom and visited Kenya, South Africa, and U.S.A. to investigate aspects of pasture management and pure seed production.

Mr. C. J. King, Chief, Division of Marketing and Agricultural Economics, visited U.S.A. on a study tour of the Livestock and Meat Packing Industries and visited the United Kingdom, Germany and Italy for enquiries on behalf of the Egg Marketing Board of New South Wales.

Mr. G. J. Shanahan, Entomologist, returned from the United Kingdom, Italy and U.S.A. and certain Research Stations in Europe where he discussed and demonstrated his findings and continued his research on insecticidal resistance in sheep blowflies. Also, he attended the 11th International Congress on Entomology in Vienna.

Visited and Returned from Overseas during the Year.—Mr. G. Edgar, Assistant Under Secretary, visited Paris as a member of the Australian delegation to the Biennial General Conference of UNESCO in November-December, 1960, and visited research and other institutions in the United Kingdom, Rome and U.S.A.

Mr. R. A. Hall, Principal Veterinary Officer, Meat Inspection Services, and Mr. E. J. Power, First Clerk and Abattoirs Officer, visited the Territory of Papua and New Guinea in September, 1960, to investigate a proposal to establish Central Abattoirs in the Territory.

Mr. J. Walker, Plant Pathologist, visited Norfolk Island in October, 1960, to investigate bean seed diseases.

Dr. A. T. Pugsley, Director, Agricultural Research Institute, Wagga, from December, 1960, to February, 1961, visited Latin America to inspect the various wheat breeding research centres conducted by the Rockefeller Foundation (New York) in association with various Government organisations and universities.

Staff Numbers at 30th June, 1961

	Public Service Board	Ministerial	Total
Central Administration	659(1)	7	666
Division of Science Services	103	..	103
Division of Plant Industry	153	..	153
Division of Horticulture	118	..	118
Division of Dairying	144	..	144
Hawkesbury Agricultural College	71	74 (2)	145
Wagga Agricultural College	43	32 (3)	75
Experiment Farms and Stations	93	217 (4)	310
Division of Animal Industry—			
Head and District Offices	160	12	172
Meat Inspection Service	143	17	160
Queensland Border	58	1	59
Tick Quarantine Areas	21	541	562
Royal Botanic Gardens and Allied Activities	120	3	123
	1,886	904	2,790

(1) Includes *inter alia* the Division of Marketing and Agricultural Economics, and Division of Information Services.

(2) Includes 8 casual employees.

(3) Includes 4 casual employees.

(4) Includes 26 casual employees.

Personnel Branch

Selection and Induction.—The Personnel Officer acted on selection committees as required. Authority delegated by the Public Service Board for employment of certain categories of labour was exercised.

Officers and employees who entered upon duty at head office and metropolitan branches were interviewed, appropriately placed and duly inducted.

Officers recruited overseas were met on arrival at Sydney; and arrangements made for their accommodation and welfare before they went to their positions.

"Manual of Information".—This publication for newly appointed members of the staff was fully distributed.

Careers Advice.—Educational authorities, employment bodies, students and parents sought and were given information and advice on careers in agriculture. Many inquiries of this nature were received from overseas.

Tutorial Assistance.—Tutorial classes were organised for metropolitan officers, candidates preparing for clerical grade examinations. Country candidates were assisted by correspondence courses. Field officers were also given tutorial assistance and the use of a select library maintained by the Personnel Branch comprising essential text books and other study material.

Liaison with Public Service Board Examination Branch.—Close contact was maintained in connection with the several grade examinations and other tests, and discussions were held on revised syllabuses and prescribed texts.

Advice to Personnel.—Advice and guidance were sought on educational matters and career prospects. A wide range of personal problems was dealt with. Some officers were referred elsewhere for specialised assistance. The Personnel Officer visited a number of country centres where he met and interviewed officers. Country officers attending conferences and on leave in Sydney availed themselves of the personnel services.

First Aid Services.—The Matron and First Aid Officer attended to 357 cases of minor indisposition or disability (174 male and 183 female). Provision was made for first aid facilities at Departmental institutions. Interest in officers absent from duty through prolonged illness was maintained, and assistance was arranged in distress cases.

Chest X-rays, inoculations, and blood donor service were organised. Improvements to the First Aid Room were effected during the year.

Trainee-cadet System.—Ten trainees (university) and four cadets (agricultural college) completed their courses in 1960. They were appointed to positions in the Department.

Forty-three traineeships tenable at the University of Sydney, University of New South Wales and University of New England, and thirteen cadetships tenable at Hawkesbury Agricultural College and Wagga Agricultural College were made available for 1961.

Publicity given to the availability of traineeships and cadetships evoked widespread interest and inquiry. There was a record number of applications.

Induction School for Trainees.—A two-weeks induction school was held at Yanco Agricultural Research Station for the trainees immediately prior to the commencement of the 1961 academic year.

Colombo Plan and F.A.O. Fellows.—Co-operation with the Commonwealth authority continued to provide training facilities for Fellows under the aegis of the Colombo Plan and Food and Agricultural Organisation. Itineraries were arranged for individual students, and for groups, from Vietnam, India, Indonesia, Laos, Taiwin, Philippines, Israel, Burma, Sarawak, Nepal, Pakistan, Ceylon, Iraq, Egypt, Thailand, North Borneo and Chile.

Legal and Registration Branch

ACTS PASSED

Dairy Industry (Amendment) Act, 1960.—Under the Dairy Industry Act, 1915-1960, the manufacture of margarine is controlled by licence. There are two classes of margarine. Cooking margarine is margarine containing 90 per cent or more of beef fat or mutton fat and it can be manufactured in unlimited quantities. Table margarine is margarine containing less than 90 per cent. beef fat or mutton fat. Manufacture of the latter is limited by quota. The overall State quota is 9,000 tons per annum.

To prevent cooking margarine from being passed off as a general purpose margarine the Dairy Industry (Amendment) Act, 1960, was enacted. It requires that packages be labelled with the words "table margarine" or "cooking margarine", as the case may be.

Grain Elevators (Amendment) Act, 1961.—The Grain Elevators Act, 1954, set up the Grain Elevators Board to operate the grain elevator system and handle and store the State wheat crop. The Act vested in the Board all railway land on which wheat silos and storage units were erected. It made no provision for vesting of railway lands subsequently set aside for this purpose. The amending Act of 1961 was enacted to make provision accordingly.

REGULATIONS, PROCLAMATIONS

There were twenty-one gazettals of Regulations, fifty Proclamations and ninety Notifications.

Regulations were gazetted to implement the provisions of the Dairy Industry (Amendment) Act, 1961, referred to above; also to permit the sale of *Sorghum almum* seed, while retaining it as a prohibited weed seed so far as other agricultural seeds are concerned, and there was a general revision of the apple and pear grading regulations under the Plant Disease Act, 1924. This revision incorporated amendments to bring the regulations into uniformity with those operating in other States.

PROSECUTIONS

For offences under the various Acts administered by the Department 197 persons were prosecuted.

ARBITRATION—AGRICULTURAL HOLDINGS ACT, 1941

Two matters were referred by dairy farmers to arbitration under the Act. In the first case a claim was made for disturbance and improvements. The Committee made an award of £240 for disturbance and £30 for improvements. In the second case, after the hearing, the claim for improvements was settled on undisclosed terms.

REGISTRATIONS

Registrations effected during 1959-60 and those of 1960-61 are compared below:—

	1959-60	1960-61
Apiary registration	3,582	3,241
Potato licences	1,804	1,708
Stock foods	1,206	1,358
Stock medicines	1,657	1,756
Pest destroyers	1,664	1,866
Sheep brands	1,768	1,520
Sheep earmarks	1,956	1,847
Large stock brands	1,833	1,599
Fertilizers	678	662
Farm Produce Agents	316	303
Veterinary surgeons	417	432
Swine licences	35	91
Swine brands	759	2,192*

* 1,145 in last four weeks.

There was an outbreak of Swine Fever towards the end of 1960-61. It necessitated a wide check of pig farms as to whether pigs were being branded as required by the Swine Branding Act, 1940. It led to a large number of applications for registered brands during this period.

Veterinary Surgeons Board

The Board met on eleven occasions.

The prescribed examination for veterinary graduates of overseas universities was held in September, 1960. There were three candidates, all of whom failed.

Stock Medicines Board

Eighteen meetings of the Stock Medicines Board were held. Some 1,986 applications for registration of medicines were received; 110 of them are still under consideration, 118 have been withdrawn, two have been refused, and 1,756 medicines were granted registration.

Architects' Branch

Loan Funds and Consolidated Revenue Funds expended on new works and maintenance work were as follows:—

	£
Loan Funds	118,204
C.R. Funds	119,435

Work Completed.—This comprised the swimming-pool at the Hawkesbury Agricultural College; new commercial turkey raising section, stud horse stalls and yards, and two 20,000 gallon concrete water tanks at the Wagga Agricultural College; a glasshouse at the Agricultural Research Institute, Wagga; sewerage to two cottages and men's toilet, hot water system to Manager's residence, and a green house at the Alstonville Tropical Fruit Research Station; sewerage to two cottages at Bathurst Experiment Farm; a 20,000 gallon concrete water tank at Condobolin Experiment Farm; construction of dam and irrigation facilities, also sewerage to cottage at the Somersby section of Narara Citrus Experiment Station; drying racks for seed increase work, hot water system to Manager's residence, sewerage to two cottages, men's toilet block, and laboratory at quarters at Grafton Experiment Farm; men's amenity room at Leeton Experiment Farm; extension of irrigation at Lower Murray Research Station; farm garage at Narrabri Experiment Farm; glass house and new electricity supply line at New England Agricultural Research Station; cage units for 2,100 layers, with shed, at Seven Hills Poultry Research Station; laboratory and administrative block, machinery shed, and men's amenity room at Tamworth Agricultural Research Station; machinery shed at Trangie Agricultural Research Station; glass-house at Wollongbar Agricultural Research Station; orchard irrigation facilities, machinery shed, and sewerage to eight cottages at Yanco Agricultural Research Station.

Work Still Proceeding.—This includes the re-modelling of the kitchen at the Hawkesbury Agricultural College; new dormitory block, and development of irrigation facilities at the Wagga Agricultural College; construction of dam, and irrigation equipment at Alstonville Tropical Fruit Research Station; improvements to water supply at Grafton Experiment Farm; cotton storage and testing laboratory at Narrabri Experiment Farm; new officers' quarters, and ablution block at Trangie Agricultural Research Station; new dairy, facilities for rice and chemical research, and re-modelling of kitchen for new irrigation college at Yanco Agricultural Research Station.

Maintenance Work.—This comprised painting and repairs to cottages and/or farm buildings at Alstonville Tropical Fruit Research Station, Bathurst, Condobolin and Cowra Experiment Farms, Narara Citrus Experiment Station, Grafton Experiment Farm, Lower Murray Research Station, Narrabri Experiment Farm, New England and Tamworth Agricultural Research Stations, Temora Experiment Farm, Trangie, Wollongbar and Yanco Agricultural Research Stations, Glenfield Veterinary Research Station, and Queensland Border; also the desilting of tanks, sinking of bores, construction of concrete storage tanks, and maintenance and replacement of equipment on the Public Watering Places in the Western Division of the State.

Extension Service.—Many enquiries concerning building problems were attended to by letter or personal interview; and plans representing buildings to the value of £198,360 were supplied to farmers.

Pastures Protection Section

Rabbit Control in General.—Use of Sodium Fluoroacetate ("1080") has greatly increased over the past twelve months. This is partly because it has become more widely accepted as a valuable method of rabbit control, and partly because the Department has continued to conduct schools to train Pastures Protection Board Officers and thus increased the number of field officers able to advance and supervise the work of "1080" poisoning.

By frequent visits to Pastures Protection Districts the Field Officers of the Pastures Protection Section have induced the Boards to adopt improved methods of control and to more clearly define their objectives. Pastures Protection Boards generally are showing much greater interest in the promotion of the use of "1080" poisoning. Also, some Boards have established "rabbit free areas" in which every effort is being made to obtain complete eradication.

Despite the complacency that existed among landholders for many years after the introduction of myxomatosis, a realisation of the risk of failure, threatened by small rabbit populations, has become more widespread.

Three "1080" *Training Schools.*—Three schools were conducted during the year. The current position is that 96 Pastures Protection Board officers and 12 other Departmental officers have had training in the use of "1080" poison and rabbit control methods generally.

Appointment of Rabbit Inspectors.—Pastures Protection Boards have further increased the number of Rabbit Inspectors employed. The increase has been mainly for establishment of units equipped with the machinery to carry out rabbit control measures on entered properties. Advice on the establishment of such units, and on other proper equipment, has been supplied by the Pastures Protection Section. The results have been most encouraging.

Australian Plague Locust Control.—Small outbreaks of plague locusts have appeared in the Narrabri, Coonamble, Coonabarabran and Condobolin Districts. The landholders have quickly treated the hopping swarms. This is evidence of the generally increased farmer-awareness of the need for early and effective treatment to control plague locusts. It gives promise of high-efficiency control in future campaigns.

Substantial quantities of insecticide are stored at depots throughout the western part of the State. These would be ample to deal with the first stages of a campaign.

In the past it has been possible that insufficient basic material would be available in Australia for production of the insecticide. So, import of 9 tons of lindane was arranged. This does not deteriorate in the powder form. It will be held in reserve, for use should there be so serious an outbreak of plague locust that commercial supplies may not keep up with demand for insecticide.

Inspections of Travelling Stock Reserves.—In October, 1960, a new Assistant Field Officer (Reserves) appointment was made. The appointee has been fully engaged in inspection of travelling stock reserves under the control of Pastures Protection Boards. He and the Pastures Protection Field Officer have inspected over 250 travelling stock reserves, as against 146 inspected in the previous year. This has greatly reduced the outstanding applications. Provided this rate of inspections is maintained in the ensuing year, the outstanding applications for reserves will be reduced to manageable proportions.

Staff Statistics—Pastures Protection Boards

Numbers	Year ended	
	30th June, 1960	30th June, 1961
Veterinary Inspectors—		
Appointed	Nil	2
Retired	1	Nil
Resigned	5	5
Transferred	7	1
Secretaries—		
Appointed	5	8 (Inc. 2 acting)
Resigned	2	4
Retired	2	2
Deceased in Office	Nil	1
Rangers—		
Appointed	5	9
Resigned	3	2
Retired	5	Nil
Dismissed	Nil	Nil
Rabbit Inspectors—		
Appointed	21	10
Resigned	1	2
Retired	Nil	Nil
Dismissed	2	Nil

Industrial.—A new award for Secretaries was made, operative from 30th March, 1961, for a period of three years.

The new award for Rangers and Rabbit Inspectors, operative from 13th January, 1960, and mentioned in last year's report, was finally settled on 29th June, 1961. The protracted proceedings included a contested hearing before a Conciliation Commissioner. In this regard, an order was made giving Rangers and Rabbit Inspectors an additional 15s. per week when required to be responsible for the safe custody, issue, preparation, or use of the rabbit poison Sodium Fluoroacetate ("1080").

Biometrical Branch

General.—This Branch continued to specialise in the design of investigational work, and in methods-research. Advice on choice of most efficient methods of conducting experiments was available to all sections of the Department. It was given either by consultation when plans were in preparation, or as advice for improvement of proposals already formulated in Divisions. At the conclusion of individual investigations, the Branch was available for mathematical-statistical examination of experimental results, and for critical report on the significance or reliability of conclusions to be drawn from the data obtained.

The volume of consulting and of computing sought by Divisions increased. This reflected the increase in active research workers and an increase in appreciation of the value of these services.

Following an Organisation and Methods Survey, administrative action has been taken to make it mandatory for all new research proposals of any importance to be discussed with the Chief Biometrician during the early stages of planning.

Punch Card Section.—This small Hollerith Unit processed the records from Dairy Herd Recording; and produced lactation statements, monthly lists of animals completing lactation, sire surveys, annual herd summaries, and district and State summaries of production statistics.

Overtime work and an increase in staff were necessary to cope with big increases in volume of work.

Official Herd Recording records (about 5,500 cows) have been handled on punched cards only in the last two years. In this same period there has been an increase of 30 per cent. in the volume of Group Herd Recording (now about 64,000 cows).

Research Liaison Office

Chief Research Liaison Officer Appointment.—Late in the preceding year (1959-60) a new position in Central Administration was created, viz. Chief Research Liaison Officer. Dr. S. L. Macindoe, formerly Principal Agronomist (Research) in the Division of Plant Industry, was appointed to the position.

Inspecting Winter Species Research on a Taree Farm

Special problems in certain areas have led to appointment of *District* research agronomists. Agronomy research is no longer sited only at formal Experiment Farms or Research Stations.

The effect of the position will be increasingly apparent by improvements in the standards and conditions of research work in the various Divisions.

Progress Effect.—Already the effect is apparent in such ways as follow:—Research developments at Tamworth Agricultural Research Station; expansion of north coast pasture research; method of presentation of Departmental requests for research funds; planned development of dairy technology research at Hawkesbury Agricultural College; intensification of research in cotton growing and quality testing; critical review of research on Experimental Farms and Stations; planning of several major trials; increased recruitment of University trainees; attempted better distribution of research information; overall review of existing research projects; and ways and means of stepping up the rate of publication of research results.

Revision of Projects.—Divisions and Branches have been assisted in a review of research projects. Of 451 research projects so far reviewed, 253 have been discontinued, and 198 are continuing. Another 360 are in process of being reviewed by Divisional Chiefs; and 615 have yet to be brought under review attention.

When this initial review has been completed, the number of projects will have been greatly reduced. Thus greater attention to the remainder, and to new projects, will be possible.

Concurrently, a concerted effort is being made to secure publication of outstanding research results. The need has led to a request for appointment of two science writers (not yet approved by the Public Service Board).

New Projects.—Forty-three new research projects were registered during 1960-61; 11 for Plant Industry Division, 8 for Animal Industry Division, 14 for Horticulture Division, 1 for Dairying Division, and 9 for Science Services Division (2 for Biology Branch, 2 for Entomology Branch, and 5 for Chemistry Branch).

Recruiting Trainees for Research.—Effectiveness of the Department depends heavily on the number and quality of its trained professional staff. In 1960-61 two forward steps were taken; firstly, by considerable increase in the number of University trainees and College cadets appointed, and, secondly, by giving them well-planned pre-service training.

In 1960-61, 43 trainees and 13 cadets were appointed; a total of 56. This about doubled the number of trainees and cadets under bond.

Research Liaison With Other Bodies.—The Department had counselled against developments at Narrabri (and separate from the Department's new Research Station at Tamworth) of a major Research Station—financed from Wheat Industry Funds and controlled by a Wheat Research Foundation with the help of University of Sydney.

The Narrabri Station has been established, but close collaboration has been arranged—to reduce undesired overlapping in research. Co-ordination has been achieved by formation of a combined Advisory Committee for Northern Research (of farmers and research workers) to serve both the Tamworth and the Narrabri Station. In addition, the necessary research discussions are occurring between the Tamworth and Narrabri Station Directors and their staff.

An informal, mutual assistance agreement has also been entered into by the Department and the University of New England. *Inter alia,* this provides for the Tamworth Station Director of Research to have academic status in the University of New England establishment. Co-operation has also been arranged between the University of New England and the Department in surveys affecting the north-western wheat and north coastal dairying districts.

Decentralisation of Research Administration.—This has been furthered.

At the new Tamworth Station the Director of Research has assumed considerable local research responsibility. The effect will be more apparent as other senior research appointments are made there—for special research lines.

Appointment of a Supervisor of Dairy Industry Research for the North Coast has been financed from dairy industry research funds. This has led to a lot of activity by farmers' organisations and dairy industry representatives. A product of this activity is the North Coast Research Council—with the Supervisor of Dairy Industry Research as Chairman. All of the main farmer organisations, and the dairy produce factories between the Richmond and Macleay, are represented in it.

The scope of further de-centralisation of research direction, with Hawkesbury Agricultural College and Yanco Agricultural Research Stations as respective bases, is under examination.

EXPERIMENT FARMS AND STATIONS BRANCH

Scope of Activities

Technical subject matter work of the various Experiment Farms, Stations and Sub-stations of the Department is covered in the reports of the Divisions of Plant Industry, Animal Industry, Horticulture, Dairying, and Science Services, and the Agricultural Colleges.

The Experiment Farms and Stations Branch is responsible for the following activities:—

Supervision of administration of 18 Experiment Farms and Research Stations.

Supervision of Farm operations at Hawkesbury and Wagga Agricultural Colleges, and at Glenfield Veterinary Research Station.

Supervision of purchase and maintenance of plant and machinery for Division of Plant Industry projects at Berry and Graman, and for the Royal Botanic Gardens.

A State advisory service in farm mechanisation.

A limited research programme with agricultural machinery.

Administration of Experiment Farms and Stations

The administration of Experiment Farms and Stations falls into two categories—developmental and operational.

Developmental

Developmental work was done at several of the Experiment Farms and Stations.

Alstonville Tropical Fruit Research Station.—Subdivision proceeded; further access roads were constructed, and additional land was prepared and sown to crops for research, principally bananas. A greenhouse was built for research, and a store provided. Sewerage was connected to the Administrative Building, farm sheds and the two residences.

Condobolin Experiment Farm.—The water storage and reticulation system was completed; further subdivision was done; and electricity was installed. This work has practically completed modernisation of capital improvements on the Farm. Further clearing was done, and the areas of improved pastures were notably increased.

Griffith Viticultural Nursery.—It was determined that the Viticultural Nursery should be redeveloped to conduct horticultural research work, particularly soil drainage.

The area was replanned, land graded, and the drainage completed at a cost of £6,800. Action was taken to provide modern power plant and complementary equipment at a cost of £2,500, apart from Consolidated Revenue expenditures on stores, provisions, etc.

Lower Murray Research Station.—Development comprised provision of tanks for storage of 200,000 gallons of water, completion of the boundary fence of Section 4, and installation of additional irrigation equipment.

Narrabri Experiment Farm.—Preliminary cultivation and grading prepared additional areas for irrigation, further supply and drainage ditches were constructed, the main delivery channel was improved, and stock were placed on the Farm to assist in weed control. An additional research building was erected at a cost of some £5,000.

Seven Hills Poultry Research Station.—This Station was equipped with tractor and attendant equipment to modernise farm operations. Considerable equipment and facilities were installed to intensify and improve research work. The loan funds expenditure was £6,270.

Tamworth Agricultural Research Station.—Work on the new offices and laboratories, and installation of equipment in them, and work on the aesthetic aspects of the Station were almost completed. A machinery shed was constructed. Plans were almost completed for provision of a 10-acre irrigation area, including means of farm water conservation. Substantial major fencing replacements were made. Considerable road gravelling was done. A glasshouse, a potting shed, and an amenities building for farm lands were erected.

Wollongbar Agricultural Research Station.—A research glasshouse was constructed. On the Duck Creek Substation, additional clearing, extension to water supply, subdivision, and drainage facilities were achieved.

Yanco Agricultural Research Station.—Construction of the 500 acres redesigned irrigation section was practically completed, and additional irrigation facilities were provided and installed for horticultural research work. A new dairy was built.

General Summary.—As a result of development work, Alstonville Tropical Fruit Research Station, Condobolin Experiment Farm and Narrabri Experiment Farm are now so developed and equipped that research programme may be extended as problems require and staff permits; Tamworth Agricultural Research Station is so developed that it is now ready to expand its activities as one of the major research stations in the State; Griffith Viticultural Nursery is sufficiently replanned and equipped to re-engage in research work in 1961-62; replanning of Yanco Agricultural Research Station irrigation section, and additional irrigation installations, have greatly improved its suitability for agronomic, horticultural and livestock research; while Seven Hills Poultry Research Station is now a station in keeping with the intensive poultry research proceeding there.

Operational

The Branch was associated with the expenditure of £49,500 (excluding farm labour cost) in maintenance and upkeep of buildings, water supply, fences and roads, etc., on Experiment Farms and Stations.

Buildings.—The Architect's report lists the work on buildings and on water supply overseen by that Branch. In addition, farm employees under the respective Manager's supervision did other maintenance work. It included cementing of floors of sheds, etc., at Alstonville, Bathurst, Cowra, Temora and Narrabri; painting of buildings at Bathurst, Cowra, Grafton and Leeton; repairs and installation of domestic and stock water supply at Alstonville, Cowra, Narara, Grafton, Leeton, New England, Trangie, and Wollongbar, and repairs to cattle yards and stables at Leeton. In addition there was considerable minor maintenance, and an amenities building for farm hands was erected by them at Leeton.

Fencing.—Of the £49,500 operational expenditure, £5,780 was on purchase of fencing material. The fencing done comprised approximately 3 miles of boundary fences, 15 miles of subdivision fences, and 7 miles of fence repairs.

Roads.—Road maintenance has been a regular feature of Experiment Farms and Stations management. In some instances it has required the supply by purchase or by hire of equipment for road forming, and the supply of gravel and sealing. This road work comprised approximately: forming and re-forming 4 miles; gravelling and sealing 1 mile; and the installation of culverts and like structures.

Erosion Control.—Constant attention was given to soil erosion control measures. At Alstonville, approximately 5 acres of bananas were planted on the contour. The land was mechanically contoured, and access roads were laid out on the contour. Repair work to existing erosion control systems was carried out at Cowra, Bathurst, New England, Gosford and Tamworth, whilst new work was also carried out at Tamworth.

Drainage.—The principal drainage works were at Duck Creek Substation, Wollongbar Agricultural Research Station, and the Somersby Section of Narara Citrus Experiment Station. Substantial drainage works were installed at Griffith, already mentioned in the Developmental section of this report.

In the course of the work at Duck Creek and Wollongbar, some 10 chains of new drains were constructed and 230 chains cleaned. Ten chains of levee bank were put up at Duck Creek to restrict encroachment of tidal water. Eight chains of tile drain were laid at Narara, and this virtually completed the drainage installation there.

Soil Fertility.—Measures to maintain soil fertility were taken on all Experiment Farms and Stations. Primarily this was by crop rotation, including pasture phases; but on the institutions where orchards are a feature, green manure crops were used.

Irrigation.—Further irrigation development occurred at Narrabri Experiment Farm where 120 chains of new channel and ditches were constructed. Forty chains of new drain and ditches were constructed at Leeton. The annual requirement of drain cleaning at this Farm and at Yanco Agricultural Research Station is a big feature. At Leeton, the installation of efficient irrigation gates for disposal of water progressed. Replanning of Yanco Agricultural Research Station irrigation section has been reported under "Developmental".

Aesthetic Features.—Further tree plantings occurred at Condobolin, Leeton, Temora, Trangie, Lower Murray, Wollongbar, Narrabri and New England; for beautification, and for stock shelter.

Pasture for Silage Making

This farm demonstration at Leeton yielded a pasture green chop of 10 tons per acre for silage making. The pasture was Yarloop Subterranean clover—Wimmera ryegrass—lucerne.

Fodder Reserves.—There was a good cereal grain harvest. It produced sufficient grain and hay to meet the requirements of all Experiment Farms and Stations during 1960-61. The needs of Hawkesbury and Wagga Agricultural Colleges and Glenfield Veterinary Research Station were also met in part.

Very little hand feeding was needed on the cereal producing farms; and, despite the usual heavy demand made by coastal Farms, fodder stocks at 30th June, 1961, were 2,200 tons of hay and other roughage and 35,300 bushels of grain—stored at Experiment Farms. This was sufficient to meet their immediate fodder needs and to feed stock for a lengthy drought period.

Estimated value of fodder in reserve was £51,350.

Transfer of Fodder.—Two hundred and eighty-three tons of lucerne and pasture hay and 20,501 bushels of grain were transferred from cereal producing Experiment Farms and Stations to establishments where experimental activities, other projects, or climatic conditions limited fodder conservation.

Estimated value of fodder transferred was £18,193.

Seed Production.—The policy of using only standard cereal seed for general cropping purposes at Experiment Farms and Stations, outlined in the 1959-60 report, was continued.

All requisite seed was produced. It aggregated about 3,000 bushels of which 1,134 bushels were transferred to those farms where cereal seed production was not practicable. Estimated value of the seed transferred was £661.

Livestock Transfers.—Interchange of livestock between Departmental establishments occurred for research work, to relieve stock numbers (thereby reducing fodder consumption), to utilise excessive growth on more favoured farms, and for student rations.

Machinery.—Farm machinery, equipment and power are essential at these institutions both in general farm operations and for research projects.

Some major items of plant provided this year were: five tractors, a header, two rotary hoes, a combine, a gravity grader, a pick-up baler, two rotary slashers, two mowers, two fertiliser spreaders, a refrigerator, a deep freeze unit, an electric welder, a chaff cutter and blower, an incubator, an air conditioner, two power concrete mixers, a land grader, two scales, two post hole diggers, and a considerable amount of spray irrigation equipment.

There was still a substantial lag in supply of plant and equipment. It reflected funds availability rate.

To replace existing farm plant and machinery, to keep it reasonably modern, and, at the same time, to meet the needs of research work, a considerable increase in the annual allocation for purchase of plant is required.

In addition to the purchase of new plant, action was taken to redistribute plant surplus at some institutions to the estimated value of £1,475 (present value). The transfers included a tractor and some farming plant to Seven Hills Poultry Research Station, a header to Bathurst Experiment Farm and a pick-up baler to New England Agricultural Research Station.

The branch acted in a recommending role for Wagga and Hawkesbury Agricultural Colleges' and Glenfield Veterinary Research Station's farm machinery purchases. Similar action was taken relative to plant purchased from Division of Plant Industry funds and industry funds (such as the Wheat Industry Research and Wool Industry Research funds) and plant for the Royal Botanic Gardens.

Machinery Advice for Other Institutions.—Advice was given to the following Departments and instrumentalities in the purchase of machinery and plant for institutions under their control:—Departments of Education, Public Health, Child Welfare and Social Services, Tourist Activities and Immigration, Conservation, Prisons, and Government Stores (purchase of plant for other Departments); the Aborigines Welfare Board, Electricity Authority of New South Wales, Forestry Commission of New South Wales, and the University of Sydney.

The Branch provided information relating to agricultural machinery and assisted in the research work of the University of New South Wales. It also participated in the activities of the Catchment Areas Protection Board.

Advice on agricultural machinery was also sought by and given to commercial agricultural machinery firms, the Commonwealth Departments of Supply, Postmaster-General, Trade, Customs, the C.S.I.R.O., the Commonwealth Statistician (New South Wales Division), and to the British and Dutch Trade Commissioners.

The Branch collaborated with the Commonwealth Tractor Testing Committee. A film completed by the Commonwealth Department of Primary Industry with the assistance of officers of this Branch during the previous financial year was well received.

Material was supplied for Australian Broadcasting Commission broadcasts; and broadcasts were delivered by the Agricultural Engineer.

Motor Vehicles.—Seven new vehicles were supplied for Experiment Farms and Stations.

It was the continued responsibility of the Experiment Farms and Stations Branch to recommend the replacement of old vehicles at Experiment Farms; and to take delivery of all new vehicles supplied to the Department in order that they would be completely checked upon delivery.

The Branch also inspected all Departmental vehicles attached to Head Office to determine any necessary repairs, inspected vehicles after repair work had been completed and provided clearances.

General Equipment, Material, etc.—Purchase and timely supply of general stores and items of minor equipment (including the oversight of repairs to machinery and the purchase of spare parts, etc.) were supervised. The total value of stores supplied was £53,000.

Labour.—Acquisition and allocation of labour, regular and casual, for efficient conduct of the Farms and Stations were supervised.

Farmer Advisory Service on Mechanisation

The Advisory Service was well received and is to be expanded. Steps are being taken to appoint two machinery officers for location in country regions.

Agricultural Engineer's Extension Services.—The Agricultural Engineer tendered advice to the public by correspondence, telephone and personal discussion. In addition he performed the following services:—

Meetings addressed	7
Field Days addressed	4
Broadcasts delivered	21
Broadcasts recorded for country officers' use	20
News items prepared	12
Agricultural Gazette items published	5
Information leaflets issued	2
Technical Assistance in T.V. Production (A.B.C.)	1
Instruction sessions at Junior Farmers Clubs	3

Mobile Van Unit's Extension Services.—The Mobile Van remained based at Tamworth (Northern Region). Public demand for its services continued to be good. The Demonstrator gave 13 lectures and film evenings; attended 28 Field Days; participated in 3 machinery maintenance schools; prepared 25 publicity statements and broadcasts; and visited 81 farms to give advice concerning farm machinery maintenance.

Research in Agricultural Machinery.—The Branch did not engage extensively in experimental work, but tested agricultural machinery supplied from funds provided by the Commonwealth Government from the Commonwealth Agricultural Machinery Research Vote, and some items supplied from the Agricultural Extension Grant.

Sixteen machines were retested, and one new machine was tested. Research was done on solar heaters for hot water supplies for the Dairying Industry. Research on the effect of tractor noise on operators' health has been initiated in cooperation with the New South Wales Department of Occupational Health.

DIVISION OF PLANT INDUSTRY

Research Services

Staffing.—Demand for expansion of agronomic research by the Division at the various Departmental institutions and in districts has increased. Some finance has been provided from industry funds to aid in this direction, but in most cases expansion would require additional trained personnel. Loss of trained research workers to Universities and private enterprise has occurred, and staffing of research centres has been maintained only with difficulty.

Despite shortage of applicants for the research positions, eleven graduates were recruited to the Division. It was possible to appoint pasture research agronomists at Narrabri and Temora Experiment Farms, two tobacco agronomists at New England Agricultural Research Station, and a rice research agronomist at Yanco Agricultural Research Station. In addition, to build up the research strength at Tamworth Agricultural Research Station, two agronomists were appointed to carry out pasture research and plant nutrition investigations there.

The distribution of agronomists amongst the Research Stations or Colleges is as follows. Two Experiment Stations have seven agronomists, one has five, two have four, one has three, five have two, and two have one. The alteration in Experiment Farm staffing as compared with the preceding year was occasioned by staff shortages and the urgent need to fill new positions. In addition there are four District research agronomists. One is at Berry, one at Inverell, one at Maitland and one at Taree.

Industry Funds for Research.—Further funds were made available by "Industry" for research. The Wheat Industry Research Committee made a grant for purchase of plant for the black soil scarab investigations in the Inverell area; the Wool Research Trust Fund made money available for appointment of a field assistant and thus facilitated the establishment of further trials in efforts to combat the destruction caused by the scarab; the Manning District Agricultural Research Council provided funds for appointment of a field assistant to assist the pasture research agronomist in the Manning River area; and the Wool Research Trust Fund, by continuing to make money available to aid in the Galvanised Burr Control project carried out from Trangie Agricultural Research Station, made possible the appointment of a field assistant.

Plant Introductions.—A total of 569 plant introductions was made by the Division. Introduced pasture species numbered 186, vegetables 113, maize 103, tobacco 30. There were smaller numbers of other crops in the introductions.

Exchanges.—In reply to requests, many samples of seed for crops and pastures were supplied to other countries.

Regional Conferences.—Two Plant Industry Regional Conferences were held—one at Bathurst Experiment Farm and one at Trangie Agricultural Research Station. In the past, Regional Conferences were conducted at approximately two-year intervals at each Experiment Farm and College. The interval has now been extended to five years, to allow time for follow-up action to be implemented fully.

Black Soil Scarab Research—Inverell.—The species testing programme commenced in 1959-60 was continued. *Sorghum almum* again dominated the summer grass picture though *Panicum coloratum* and *Setaria* spp. also showed promise. Lucerne was still the most useful legume.

Of other perennial legumes tested, *Glycine javanica* gave best results, and a collection of strains of this species is at present under test. On the past year's results, *Vicia dasycarpa* may have value as a self-regenerating annual. *Dolichos lablab* has given results superior to cowpeas, and early strains of this species were seed increased for trials during 1961-62.

A fertiliser trial was laid down to determine the effects of phosphorus and sulphur on lucerne, but there was no apparent response to these elements. Burr medic (*Medicago denticulata*) responded to molybdenum.

A cultivation trial showed that highest yield of wheat was obtained from early sowing. November ploughing gave 37 bushels per acre. February ploughing gave only 23 bushels per acre, and December and January ploughings gave intermediate yields.

The evidence to date suggests that cereal cropping and the use of lucerne and *Sorghum almum* give the greatest financial return. With the idea of examining the feasibility of a general change to this system on the black soils, a farm management survey was conducted in co-operation with a worker from the University of New England. Results are now being analysed.

Extension Services

Staffing.—There are thirty-six agronomist Districts established, an increase by one. The new District is Muswellbrook. It comprises the Shires of Muswellbrook, Patrick Plains and Scone, with a total of 1,787 agricultural holdings. Formerly this area was part of the Maitland District. The latter still covers seven Shires and contains 3,000 agricultural holdings.

Because of resignations, secondments and transfers, it has not been possible to maintain a full complement of district agronomists. Three Districts are vacant, viz., Bathurst, Berrigan and Cootamundra. These vacancies have been caused by resignations.

Five extension agronomists resigned to accept positions outside the Department. Another has submitted his resignation to become effective in July.

Heavy and continuing loss of trained staff must result in lowered efficiency, and subsequent loss of Departmental prestige with the rural community and others associated with primary production. The shortage of trained staff has created a most difficult position. It cannot be rectified merely by recruiting. New appointees have to undergo a period of training, and gain experience in extension work.

Resignations, secondments, and appointments to more senior positions have caused a change of personnel in thirteen districts.

In-Service Training.—Six agronomists on Experiment Stations who have a potential for extension work are receiving part-time training to qualify them for the duties of District Agronomists.

Selected agronomists attended the Extension Methods School at Newport, and others an Irrigation Refresher course at Yanco Agricultural Research Station.

Two important conferences were held, the Biennial Conference of District Agronomists, at Hawkesbury Agricultural College, and a conference at Head Office to consider various aspects of the new General Closer Settlement Scheme for which this Department is responsible. These meetings provided an opportunity for officers to be kept informed of many current developments.

Extension Activities.—Extension officers continued to maintain good public relations with the rural community and those associated with primary production. Frequent requests by primary producer organisations and others for appointment of additional District agronomists indicate the value they see in these services.

District agronomists participated in at least 182 Field Days with a total attendance in excess of 9,000. They delivered talks at 241 meetings, with a total attendance of 5,424. Their radio broadcasts exceeded 560, and they gave rise to at least 580 items for newspaper publication.

Monthly reports by District agronomists, giving a summary of seasonal conditions, and crop and pasture prospects, were made available to the Press and Radio Stations, and were eagerly sought Statewide for publicity.

Extension by Other Parties.—Advisory services to the rural community, other than those supplied by the Department, continued to expand. These take the form of Farm Management Groups employing advisers, or advisory services provided by firms interested in selling their products or acquiring products of the land: fertiliser companies, seed merchants, insecticide and herbicide distributors, pastural companies, etc.

Recently a Wagga Farm Group employed an additional agronomist, and now has two advisers for eighty properties, a private agricultural consultant commenced at Albury, and, on the north coast, a commercial organisation is developing an advisory service.

These are commendable trends, as, with the resources available, this Department is unable to provide and cope with all demands for a personal service.

Fertiliser Trends

Despite the changed economic position and tightening of credit facilities, fertiliser usage continued to increase. Farmers have realised the economic soundness of judicious application of fertiliser.

The principal demand is for phosphatic fertiliser in the form of superphosphate, though interest in and use of nitrogenous fertiliser is expanding.

Nitrogenous Fertilisers.—The increase in use of nitrogen is most marked on coastal pastures, applied to increase growth during the cooler months.

Demand for nitrogenous fertilisers other than sulphate of ammonia is increasing, in the form of calcium ammonium nitrate and urea.

Anhydrous ammonia, used successfully overseas, has not been available commercially in Australia in economic quantities. This position is likely to change shortly. Local manufacture will assure adequate production at a price competitive with other forms of nitrogen.

Anhydrous ammonia, containing 82 per cent. nitrogen, is applied to the soil as a gas under pressure. Special equipment is required; consequently suppliers will contract to do the work. In certain areas it will make a valuable contribution on winter pastures.

Potassium Fertilisers.—Demand for potassium fertilisers is of minor importance though these are attracting greater interest.

Superphosphate Increases.—Superphosphate sales by New South Wales manufacturers increased from 270,000 tons in 1958-59 to 370,000 tons in 1959-60 and 425,000 tons in 1960-61. There have also been sales from Victorian and Queensland sources.

Sulphur-fortified superphosphate usage has increased from 2,000 tons in 1957-58 to 14,000 tons in 1960-61. Mo Superphosphate usage in 1956-57 was 24,000 tons, and in 1960-61 was 23,000 tons; DDT Superphosphate in 1959-60 was 750 tons, and in 1960-61 was 1,250 tons.

Bulk Handling of Superphosphate.—Bulk handling of superphosphate increased from 120,000 tons in 1959-60 to 200,000 tons in 1960-61. Of the latter, 160,000 tons was spread by air under the Group Plan organised by the distributors.

Cost of supplying and spreading superphosphate ranged from £17 9s. 6d. per ton—200 miles from Sydney and within an eight-mile radius of the respective air strip, to £18 9s. 6d. per ton at Armidale within a radius of twelve miles from the air strip.

Bearing on means of keeping down costs of farm production, it is of interest that in 1957 superphosphate supplied in jute bags at the works cost £14 10s. 6d. a ton; whereas, in 1961, bulk superphosphate cost £10 14s. a ton—less 10s. per ton rebate during the off-peak period 1st July to 31st October.

Gypsum.—Gypsum as a source of sulphur, and also sulphur fortified super, are being used more widely on soils known to be deficient in sulphur.

In addition, gypsum is assuming increasing importance for application in irrigation water to some of the more difficult clay soil types, as in the southern irrigation districts (see next heading).

Gypsum—Application in Irrigation Water.—Subsequent to research undertaken by the C.S.I.R.O. relative to the application of gypsum in irrigation water, an agronomist was appointed to Deniliquin by the Department to co-operate with the C.S.I.R.O. in demonstrating the value of gypsum when applied in irrigation water to certain soil types.

Seven experiments and eight demonstration areas were established on farmers' properties in the Deniliquin, Finley and Barham districts.

Gypsum, when applied in irrigation water to heavy clay soil types with little or no top soil, acts as an electrolyte to prevent the dispersion of clay particles. It maintains their flocculation, thus assuring a satisfactory initial seedling emergence. Applied to some heavy clay soils having little or no top soil the treatment has shown excellent promise. Seedling emergence has been increased from 80 per cent. to 300 per cent. Response on the loams and clay loam types has not been outstanding. More research is needed on these soil types before firm recommendations can be made.

Fodder Conservation Trends

Supplementary feeding of stock was again necessary over extensive areas in various parts of the State. Landholders generally have made a determined effort to maintain substantial supplies of conserved fodder. Though insufficient to meet a major drought, present fodder reserves would enable most stockowners to keep their stock alive for other than an unusually long period of unfavourable conditions.

District agronomists experienced increased demands for information and advice. They gave demonstrations and advice on all facets of this part of farm management and development programmes.

Bulk Storage of Oat Grain.—Silo storage continued to gain in popularity. The oats are largely from fodder crops grown for winter grazing, closed up in early spring to give the regrowth an opportunity to produce grain. The oat crop fits in very well with wheat in the crop rotation.

Attention to Quality Roughage.—The need for high quality roughage in the feeding programme has received more attention. With baled hay, loose hay stored with new machines, and sheaf hay in some areas, landholders have paid more attention to the harvesting, curing processes and protection during storage. Their aim has been a product with higher feeding values for the less favourable periods.

Plastic Covers for Hay Stacks.—A new plastic material—hessian impregnated with P.V.C.—proved very promising as a cover for hay stacks in tests at Leeton Experiment Farm. This new material is durable and withstands damage by mishaps. Indications are that it also stands up well to continual exposure to the weather. Previous experience with plastics for covering haystacks was disappointing.

Artificial Hay-curing.—Preliminary investigations with artificial curing of hay by the barn hay-drying method were carried out at Berry and at Hawkesbury Agricultural College.

Silage Demonstrations.—Silage making continued to gain momentum, particularly in mid-coastal areas. Seven demonstrations were commenced, to demonstrate the use of pole and mesh tower silos, bunker silos, and vacuum packed silage.

New Fodder Storage Methods on Trial.—Interest is being taken in a new method of storing fodder involving the use of expensive equipment. Eight units of equipment have been imported—seven for this State and one for the Federal Capital Territory—at a cost of £5,000 to £6,000 per unit. Data is not yet available on the feeding value of such new fodder under local conditions.

Co-operation in Rain-making Experiments

The Department continued to co-operate with the Radio Physics Division of C.S.I.R.O. in rain-making experiments in the north-west (Tamworth) and the Warragamba Water Catchment Area. The Warragamba project also has the co-operation of the Metropolitan Water, Sewerage and Drainage Board.

Cloud seeding operations over Warragamba commenced in December, 1959, and continued whenever cloud formation was suitable. Conclusions may not be expected for at least another year but trends are favourable.

Land Settlement Scheme

New Scheme.—The War Service Land Settlement Scheme has been replaced by a new "General Closer Settlement Scheme".

During 1961 there has been marked activity in land inspection for closer settlement. This Department co-operated with the Closer Settlement Advisory Board. District agronomists were called upon to carry out preliminary inspections of estates and advise on their suitability for closer settlement, to undertake the soil classification and assist with topographical surveys, to advise on production potential, and assist with farm designs.

Estate Reviews/Inspections.—Forty-five estates were reviewed. The total comprised:—

Fifteen preliminary inspections to determine whether the estates were suitable for closer settlement and whether a topographical survey was warranted.

Twenty estates requiring a topographical survey and a submission of a Type "B" report.

Six estates acquired for closer settlement and, in respect of which, assistance was given to Lands Department officers in the design of farms.

Two special inspections and joint reports prepared by officers of the Agriculture and Lands Departments.

Two promotion cases.

Farmer Competitions

Competitions covering some facets of farm management and crops (wheat and maize), sponsored by the Royal Agricultural Society, and the "Country Life" Newspaper in co-operation with the Milk Board, were locally organised by country show associations and/or other organisations. Agronomists helped by judging these competitions and by participating in subsequent field days.

Wheat Crop competitions continued to be popular, to such an extent that it was necessary to restrict the number of entries judged by agronomists.

Assistance, in the form of judging, was given to the Royal Agricultural Society and country show societies in their shows.

Pastures Section

GENERAL

Sown Improved Pasture Areas Increased.—Following a slight downward trend in the area sown to improved pastures in 1958-59 the most recent figures from the Government Statistician (March, 1960) show that the upward trend, a feature of the post-war agricultural development of New South Wales, is again evident. The 1960 area of improved pasture, including paspalum, was 9,143,000 acres. The peak figure was 9,238,000 acres in 1957-58.

Increased Pasture Seeds Production.—Local production of pasture seeds continued to increase. Subterranean clover seed production has stabilised at about 1,800 tons per year, but marked increases have occurred in *Phalaris tuberosa* and Perennial ryegrass. The value of certification in encouraging local production has been demonstrated by the rapid increase in the production of Kangaroo Valley ryegrass, of which 26 tons was produced in the second year of the operation of the certification scheme. Another interesting feature in this field is that the growers of certified Kangaroo Valley ryegrass have formed a strong association and are organising the cleaning and marketing of their seed in a very orderly manner.

Difficulty in arranging seed increase of promising new strains of pasture species has long been a restricting factor to their further large scale trial and subsequent commercialisation on farms.

A range of subtropical legumes and grasses has now been established at Grafton for seed increase. Seed produced this year includes 30 lb. of Siratro "A".

Yanco Agricultural Research Station has continued to make progress with the increase of seed of new and promising pasture strains. Seed produced at Yanco this year included experimental quantities of *Stipa hyalina, Hordeum bulbosum, Setaria sphacelata, Atriplex semibaccata,* and the Wenigup, Eastern Turkey and Madrid subterranean clovers.

F.A.O. World Seed Year.—The Pasture Section took an active part in Australian facets of the F.A.O. World Seed Year. This was organised to encourage the use of higher quality seed, basic to more productive agriculture.

Extension Service.—Activities in connection with pastures continued to be major part of the work of most District agronomists, and a large number of their field days were on pasture demonstrations.

The uniform Pasture Survey Extension Trials (U.P.S.E.T.) served as a basis for many of the field days. The extension and research value of these trials has amply justified their prominence in the work of the Section.

U.P.S.E.T. (See also under "Pasture Species Research").—In addition to their direct value in the work of this Division, these trials are providing basic data for research by the Division of Science Services. Their value has now drawn in also the Division of Animal Industry, and special trials were this year designed and established to help solve mineral imbalances increasingly important in animal nutrition.

During 1960-61 an additional 414 trials were packaged and distributed, to make a total of 1,022 trials. In consequence, District agronomists now have five times as many trials in hand as before the U.P.S.E.T. system was implemented.

Dairy Industry Extension Grant Demonstrations.—Some forty new demonstrations were approved for establishment during the year.

Agricultural Extension Grant Demonstrations.—All former A.E.G. demonstrations were terminated, but establishment of twenty-six new demonstrations was approved.

PASTURE RESEARCH

Pasture research was continued in 1960-61 at the various Agricultural Colleges, Research Stations and Experiment Farms, and by District agronomists (research) located at Inverell, Maitland, Taree and Berry.

Scope.—Research projects with sown pastures were concerned with a wide range of problems on pasture species, seed increase, seed production, species establishment, legume inoculation, fertiliser use, pasture management, utilisation by livestock, and farm economics.

Improvement and conservation of natural pastures, and the special problems of Western Division pastures, also received attention—from bases at Yanco, Condobolin and Trangie.

Industry Funds Support.—Active financial support for pasture research has been given by the dairy, beef, wool and wheat industry research funds and by fertiliser and chemical firms.

Teamwork with Livestock Divisions.—Pastures are not solely the province of any one Division. Whilst the Division of Plant Industry is primarily responsible for pasture production and feed year provisioning, the livestock production Divisions are concerned with conversion of pastures, forage and fodder into livestock products. Hence, pasture management and pasture utilisation is a joint field, lending itself to a teamwork approach between feed-production and livestock-production workers. This approach has become characteristic of the research at Wollongbar, Leeton, Cowra and other Departmental centres.

Pasture Species Research.—The Department continued to test introduced pasture species in a range of New South Wales environments.

Progress in development of subtropical legumes and summer-growing grasses at north coast centres for use in coastal, north-western and irrigation area pastures is notable.

A limited programme of strain selection continued at New England Agricultural Research Station with *Dactylis glomerata* and *Triofolium repens*. Testing of the resultant synthetic strains under grazing is proceeding.

Free-seeding strains of *Pennisetum clandestinum* are under observation at Grafton to see if variation exists, as a basis for selection of more desirable Kikuyu grass types.

The U.P.S.E.T. series of pasture species trials has provided a State-wide survey of strain and species adaptability in respect of lucernes, annual winter growing grasses and legumes, perennial winter growing grasses and legumes, summer growing grasses, subtropical legumes, annual summer growing legumes and species adapted to wet and swampy areas.

Individual pasture species highlighted in the trials this year included *Hordeum bulbosum, Bromus inermis,* Kangaroo Valley ryegrass, *Phalaris tuberosa, Dactylis glomerata* of both European and dryland types, Ronph grass, *Bromus nakuru, Cenchrus ciliaris,* various Buffel grass strains, *Hyparrhenia hirta* and *Setaria sphacelata.*

In the legume range promising reports were received on *Glycine javanica, Dolichos lab lab* (various strains), *Dolichos axillaris,* Sivatro, Marrar and Wenigup subterranean clovers, Hairy Peruvian lucerne and *Trifolium repens* (Ladino, Louisiana and Israel strains).

Following the preliminary testing in rows and swards, there are now larger scale species-grazing trials at Wollongbar, Grafton, Yanco, Trangie, Hawkesbury Agricultural College, Cowra, Temora and Condobolin.

Hairy Peruvian lucerne has given superior winter growth to the standard Hunter River strain in a number of cooler tableland and southern districts; however it now appears that this advantage may be offset by other weaknesses.

Kangaroo Valley ryegrass is under certified seed production in New South Wales and has shown outstanding persistency, heat tolerance, and drought resistance, in trials at Berry, Cowra and Grafton, and in some U.P.S.E.T. trials.

For pasture improvement in tableland and slopes areas *Phalaris tuberosa* continues to be the premier winter-growing perennial grass. Cheaper seed, as a result of good seasons and modern all-crop header direct harvesting methods, is fostering its progress in keeping with its inherently good qualities of persistency, carrying capacity, and competition value against pasture weeds.

The dryland, summer dormant Cocksfoots (*Dactylis glomerata*) of Mediterranean origin (e.g., C.P.I. 2145 from Brignoles, France) are also showing promise in the hotter and drier areas. They are markedly superior to the summer and autumn growing European types in persistency under these conditions.

The Buffel grass strains continue to show promise on the lighter soils of the north and west, but problems of seed availability, establishment, and palatability, are limiting their acceptance.

Setaria sphacelata (South African pigeon grass) has been shown to have wide adaptability, including a tolerance to river flooding and wet swampy conditions.

Under north coast conditions *Panicum maximum, Paspalum yaguaronense, Pennisetum purpureum* (Elephant grass), *Bachiaria mutica* (Para grass) and Chloris-gayana strains are showing promise.

Legumes which are thought to have a place in the north coast "feed year" include *Leucaena glauca, Aeschynomene falcata, Glycine javanica, Lotononis bainesii, Dolichos axillaris* and *Dolichos lab lab.*

In the drier marginal farming areas at Yanco, *Stipa hyalina* and *Hordeum bulbosum* are under grazing trial, to assess their possible value and to determine any weed potential they might have.

At Leeton, production curve studies are being undertaken on Wimmera rye-Subterranean clover, *Paspalum dilatatum*-White clover, and *Phalaris tuberosa*-Subterranean clover pastures. Seasonal production data on these pasture types is providing a basis for the development of an adequate feed year programme for particular livestock production purposes under irrigation. In this regard, appropriate supplementation with forage crops, conserved fodders, and nitrogen fertiliser-boosted pastures is subject matter for research.

Pasture Establishment Research.—Much attention has been paid to pasture establishment problems during the past decade. This year, research continued with special reference to the:—

Rhizobium inoculation problems of pasture legumes.

Gypsum use in pasture establishment on heavy clay soils in southern irrigation districts.

Special problems presented by coarse-textured granite soils, and

Difficulties in establishing pastures by surface seeding from the air.

In the latter regard, valuable contributions came from research by the weeds research agronomist at Bathurst whilst investigating methods for establishing competing pastures on non-arable, Serrated Tussock infested lands.

Problems of pasture establishment under cereal nurse crops have been investigated at Yanco, along with the associated matter of improvement in carrying capacity of native pastures.

Fertiliser and lime use and fertiliser placement have also received attention by research agronomists and through the U.P.S.E.T. series. Use of the roller-drill and seedbed compaction factors are currently being reviewed.

Special attention is being given to the "competition" factors, such as weed growth, and clover, in the establishment of perennial grasses.

Valuable research was done on the use of herbicides as an aid to the establishment of both summer and winter growing species in coastal pastures.

Research into Plant Nutrition and Fertiliser Use.—Pot nutrition trials in the glasshouses continued to provide valuable pointers (in parallel with field trials) for amendment of soil deficiences for crop and pasture growth.

Pot tests have been mostly diagnoses of the main plant nutrient deficiencies in soils from various districts of the State where crop or pasture nutrition problems were apparent. A number of more specialised investigations of deficiency, toxicity and nutrient uptake have also been carried out. These included sulphur recovery studies from six grades of gypsum and other sulphur-supplying fertilisers. This type of study has been done in co-operation with officers of the Chemistry Branch, Division of Science Services.

Trials with superphosphate have been concerned with responses in pasture growth to rates, times and frequencies of application, and with the requirements of various soils and pasture during establishment, build-up and maintenance stages of pasture development. Hunter Valley trials have shown that 4 cwt. per acre of superphosphate gave maximum yields in the first year, and that 3 cwt. per acre may also be required in the second and third years for maximum yields under the conditions ruling.

A striking feature concerning fertiliser use at Yanco was the indirect Skeleton weed suppression effect of superphosphate applied to improved pastures. This has been particularly noticeable in the nil-treatment plots of two superphosphate trials on lucerne-subterranean clover pasture; the nil-treatment plots are distinguished by their dense stands of Skeleton weed.

A progress report on the Department's recent investigations with nitrogen fertilisers on pastures and fodder crops records that there is a place for economic use of nitrogen fertilisers. Research has shown that nitrogen can be used to reduce bloat risk on normally clover-dominant pastures in spring, to augment autumn-grown feed against winter shortage, to start the spring earlier, and to produce better yields of high quality spring hay for conservation. It also has an economic place in growing grass seeds and in the production of supplementary forage and fodder crops.

Lucerne nutrition problems in coastal areas have been investigated in co-operation with the C.S.I.R.O. Results indicate that boron and potash deficiences may be involved in lucerne-browing problems on the north coast.

Pasture Management and Utilisation Research.—Increasingly this has been directed towards a solution of "feed-year" problems—combining the resources of pastures, forage crops, conserved fodders and grains; to provide the most profitable year-round feed cycle for livestock production in each particular area. A much closer relationship between pasture management, pasture utilisation and animal husabandry experimentation is apparent at research centres—Leeton, Cowra, Wollongbar, Hawkesbury Agricultural College, Yanco, Grafton, Glen Innes, and Berry.

In a "rate of stocking" trial at Cowra this year, on a Wimmera rye-sub. clover-lucerne pasture, stocking rates of 1, 2, 3 and 4 breeding ewes per acre produced wool yields of 9.1, 15.9, 22.35, and 30.0 lb. of wool per acre respectively. "Rate of stocking" trials with both beef cattle and breeding ewes are proceeding on irrigated pastures at Leeton. Plans have been discussed to carry these limited "production per acre" trials forward into a rotational farmlet stage, to permit more useful economic analysis of costs and returns.

At Wollongbar, following the satisfactory completion of a vetch grazing trial, a more comprehensive production trial was commenced to compare costs and production of an unimproved farmlet and an improved farmlet. In the latter case, accumulated research data is being applied so that a complete feed year is available to the lactating cow. The aim is to assess the economic value of improved techniques by costing all operations, and accurate measurement of butter production on both farm units. This project is co-operative between the Divisions of Animal Industry and Plant industry.

At Hawkesbury Agricultural College a breeding ewe grazing trial has shown that 7-8 ewes can be carried per acre on the improved irrigated pasture, whilst the carrying capacity of adjoining native non-irrigated pasture was approximately one-half ewe per acre. With rationing of feed according to seasonal need, and use of the two pasture types in conjunction, an overall stocking of 10 ewes per acre was achieved under the conditions of the experiment.

In the Berry area the feed shortage problem has been studied on a whole-farm basis on farm properties. Results have demonstrated that two systems appear to offer more economic milk production; notably, the use of nitrogenous fertilisers on ryegrass dominant pastures, and the sodseeding of oats and fertiliser nitrogen into paspalum-white clover pastures at the end of March, to May.

Pasture Research Affecting Marginal Areas and the Western Division.—Operating from Trangie, a pasture agronomist is studying problems in the northern half of the Western Division. Problems associated with conservation and wise use of existing species, and the possible introduction of new species, are the main subjects to study, especially in the central Darling and upper Darling sections.

Provision of a four-wheel drive Land Rover vehicle, together with a chisel-seeder attachment, has facilitated the extension of this Western Division programme.

Pasture Seed Certification

Agronomist (Seed Production) Appointed.—The growing importance of pasture seed production and certification has led to the establishment and filling of a new position, viz., Agronomist (Seed Production).

Seed Certification Revenue.—Revenue from seed certification fees amounted to £7,200, compared to £6,500 for the previous year.

Acreage of Certified Pasture Seed Crops.—Despite an unfavourable season for *Phalaris* seed production in the northern tablelands, reflected in the withdrawal of 51 per cent. of the acreage originally registered, and a relatively poor sub. clover year, shown by the withdrawal of 22 per cent. of the registered area, the production of certified seed was above average. The quantities of seed finally certified were as follows:—

	Tons
Subterranean clover	1,600
Phalaris tuberosa	140
N.S.W. perennial ryegrass	52
Kangaroo Valley perennial ryegrass	26
Barrel Medic 173	4

The following table gives details of areas and production:—

Areas and Production of Certified Seed

	Sub-Clover	Phalaris	Perennial Ryegrass	White Clover	Barrel Medic 173	Total
Number of Areas Registered	337	142	35	7	4	525
Acres Registered	36,880	14,499	1,311	933	183	53,806
Acres Passed	25,358	6,769	1,084½	855	183	34,249½
Acres rejected	3,402	308	21½	..	...	3,731½
Acres Withdrawn ..	8,120	7,422	205	78	..	15,825
Bags Paddock Sealed	31,638	5,275	3,661	77	84	40,735
Lines Sampled and Tested	319	173	72	2	2	568
Bags finally Sealed..	25,962	2,364	1,883	..	60	30,269

The rules of the various pasture seed certification schemes were revised and made as uniform as possible. A booklet of Instructions to Certifying Officers was prepared.

Inspections under Various Acts.—The number of stores inspected totalled 243. As a result, seven warnings were issued under the Agricultural Seeds Act and sixteen under the Stock Foods and Medicines Act. No prosecution was launched under the Agricultural Seeds Act. One prosecution under the Stock Foods and Medicines Act and two under the Veterinary Surgeons Act are pending.

Seed Testing Laboratory

Volume.—About 3,000 samples were tested, compared to about 2,500 last year. During the peak of the season, to enable certified samples to be expedited, the commercial samples were delayed for two months. By the end of the year, however, there was no back log of work.

New Equipment.—The rules of procedure have been bound in the most comprehensive Method Book yet produced for the staff; and a second book, for senior staff, has been commenced.

Two new microscopes with illumination have replaced obsolete apparatus, and an improved blower has been installed. Two more blowers expected shortly will be stored till more accommodation becomes available. A new germinating chamber was in operation during the latter part of the year, replacing a smaller one.

A suggestion was made that the photographs used in the "Weeds of New South Wales" and the coming pasture handbook should be used in a separate publication for seed producers generally, but more attention needs to be given to the maintenance of the type specimen collection. Very little time has been given to this highly necessary work. The main collection has been increased by the addition of diseased seeds and insects because separation from the Division of Science Services has affected contacts with that Division.

Representation in Committees.—The Seeds Officer was active in the Purity and Germination Committees of the International Seed Testing Association and the Editorial Committee of the Australian Seed Testing Newsletter; and has received the reports of the International Standards Organisation Technical Committee 34, Propagation Materials, for the Australian secretary of the Standards Association.

Advice on Phalaris Seed Damage.—A report to agronomists on the effect of damage on the germination of certified *Phalaris tuberosa* last year was of value. The survey was continued this season and a further report was issued. Demonstrations were given to several officers of the Department and to seed producers on this subject.

Weeds Section

General

Skeleton Weed Observations.—A feature of weed control experiences was the extent of unsatisfactory results from the spraying of cereals infested with skeleton weed. There were three main factors associated—wet seasonal conditions, methods of seedbed preparation, and methods of spraying.

The wet conditions of the season resulted firstly in reduced trans-location of 2,4-D so that regrowth commonly occurred from just below soil level. Continued wet weather helped produce excessive regrowth, while the prolonged harvest period gave the skeleton weed about a month more than usual to become important by harvest time.

Results in crops sown on stubble were often inferior due to the fact that more thorough preparation helped to reduce the reserves of skeleton weed. Some failures were also related to spraying technique, particularly aerial spraying at very low volumes. Some operators were more successful at these low volumes than others.

A second aspect of the skeleton weed problem is the continued spread into both north-western and south-western districts. Concern at spread into the north-west led to special surveys, followed by a Conference of Local Government organisations at Quirindi—attended by a number of Departmental officers.

Australian Weed Control Conference.—A highlight of the year was the 2nd Australian Weed Control Conference, held at Canberra and attended by four agronomists from the Department. The Department played a major part in the Conference, contributing eighteen of the papers presented. The discussions between weeds research workers from all parts of Australia were valuable to all participants.

Liaison with Other Departments.—Close liaison was maintained with the Department of Local Government in connection with the administration of noxious plant legislation. On a recommendation from this Division approved by the Minister for Agriculture, a grant of £40,000 by the Department of Local Government to Councils was distributed as follows: eight County Councils, £23,050: 59 Shire Councils, £15,350; and 12 Municipal Councils, £1,600. Many Councils have shown an increased interest in noxious plant control. However, although as a general rule the "weeds" County Councils have achieved the best results, there was little co-operation from Councils towards formation of new "weeds" County Councils.

Recommendations were forwarded to Department of Local Government for numerous changes in noxious plant declarations.

Further investigations on the control of aquatic weeds were made in co-operation with the Electricity Commission; and advice was provided to the Departments of Railways, Public Works, and Main Roads, the Forestry Commission, and the Postmaster-General's Department.

A conference was held with representatives of the Victorian Vermin and Noxious Weeds Destruction Board in connection with anomalies in the control of noxious plants in border areas.

Relationships with Local Organisations.—Close liaison was maintained with Shire, Municipal and County Councils and Pasture Protection Boards in connection with all aspects of weed control. Several of the "weeds" County Councils, in particular, helped the Department in investigations. Co-operative extension activities were undertaken, particularly as regards displays at country shows. Several of the County weeds officers assisted District agronomists by advising landholders on weed control.

Relationship with Herbicide Manufacturers.—Approval was granted for a research officer of Geigy (Aust.) Pty. Ltd. to carry out investigations in co-operation with the Department at Hawkesbury Agricultural College. Close liaison has been maintained generally with herbicide manufacturers and there were many donations of herbicides for use in research. A special Field Day was held at Hawkesbury Agricultural College to demonstrate ways in which the Department could further the manufacturers' own research programmes.

Special Advisory Activities in Weed Control.—Successful schools for Council Weeds Officers and others concerned with the dissemination of weed control advice were held at Tamworth and Bega. They were attended by personnel in the Northern and North-western and the South Coast and Tablelands Agricultural Regions respectively.

A regular section ("Talking of Weeds") was established in the *Agricultural Gazette of N.S.W.*

Weeds were also featured in the Department's exhibit at the Royal Agricultural Show and in co-operation with C.S.I.R.O. at the Science Sheep Show.

WEEDS RESEARCH

Serrated Tussock Control.—Highlights of this research included the information that spelling of a new-sown pasture during the first year kills from 76 to 95 per cent. of the serrated tussock seedlings which establish with the pasture.

On non-arable land, competition by subterranean clover alone over a four-year period has reduced the number of serrated tussock plants by 50 per cent.

Related research has defined climatic conditions for satisfactory establishment of aerial sown clovers. June and July have proved the best periods on the Central Tablelands.

The value of herbicides to obtain a kill of serrated tussock on non-arable areas was further demonstrated. Successful control has been achieved at as low a rate as 3 lb. of 2,2-dichlorpropionic acid per acre in many districts, under defined conditions of time of application and burning. Where the herbicide was applied to a clover-serrated tussock association, 98 per cent. of the serrated tussock was controlled while clover alone killed 15 per cent. in an eighteen-months period.

The effect of the absence of clovers was clearly demonstrated in a trial commenced in 1957. Areas sprayed and oversown are now practically free of serrated tussock despite a considerable establishment during the first year. Areas oversown only, now carry about 50 per cent. of the original infestation. Areas which were sprayed only and not oversown at present carry about one-third more of tussock plants than were present when the trial commenced.

Despite the success of this serrated tussock research on both arable and non-arable areas, the extent to which farmers have applied the results is disappointingly small.

Control of Weeds in Vegetables.—Trials in the Murrumbidgee Irrigation Areas, on the far north coast, at Bathurst, and on the central coast, aim to correlate reactions of vegetables to various herbicides under as many conditions as possible.

In onions, a saving of £60 per acre was demonstrated by the use of herbicides, as compared to the normal hand-weeding. In addition, yields from sprayed areas were superior to yields from hand-weeded areas.

Effective weed control was obtained in beetroot, silver beet, lettuce, tomatoes, capsicums, cabbages, cauliflowers, beans, peas, cucumbers and pumpkins. CDAA and CDEC proved the most widely applicable herbicides; but monuron, CIPC, EPTC and several others were also effective for particular uses.

Anomalous results obtained with vegetables in the M.I.A. require further investigations.

Weeds Control Research in Other Crops.—Maize, sorghum, rice, cotton, linseed, cowpeas and lupins were also the subject of herbicide trials for weed control.

A new herbicide, sodium-2,3-Dichlorisobutyrate, proved very promising for control of barnyard grass in rice.

Good control of weeds in maize was achieved by the use of the herbicides Simazin and Atrazine. These, at a cost of about £3 per acre, resulted in yield increases of the order of 20 per cent.

Trials were also conducted in grapes, gladiolus and various other fruit and horticultural crops with satisfactory results in most cases.

Chemical Seedbed Preparation.—At Wollongbar, there was progress in the studies of chemical seedbed preparation. It has been shown to be quite feasible to use a herbicide to destroy a paspalum sward a few weeks before sowing summer legumes. Although somewhat better growth occurred in clean seedbeds, satisfactory results at lower cost were obtained on chemically prepared seedbeds. Sod-seeding into untreated paspalum swards proved a failure.

COMMENTS ON SPECIFIC WEED PROBLEMS

Serrated Tussock.—Despite satisfactory control methods released by successful research, serrated tussock is still one of the major noxious plant problems of the State. Few farmers have undertaken control and, all too often, Shire Councils have failed to further the research findings.

New infestations were found on parts of the Northern Tablelands, and also on parts of the Southern Tablelands where a more intensive search was made. This applies particularly to the Snowy River area.

There, a positive programme of serrated tussock research and control has been initiated by the Council. Two forty-acre demonstrations of aerial seeding for serrated tussock control were established near Queanbeyan in an endeavour to have farmers recognise the value of this method on non-arable lands.

Water Hyacinth.—Concern was felt at the discovery of water hyacinth in no fewer than four inland districts, ranging from Deniliquin in the south to Moree in the north. If not controlled, water hyacinth could become a serious problem in inland rivers and irrigation areas.

Groundsel Bush.—On the north coast, groundsel bush, originally introduced as a garden shrub, has continued to spread. This is despite active efforts by Councils concerned. This shrub could become a most serious pest, although, fortunately, it has been killed fairly readily by spraying with 2,4-D.

Lantana, and Camphor Laurel.—These woody plants are also spreading and causing much concern on the north coast.

Weeds of Clover-Dominant Pastures.—In the southern half of the State, weed problems of clover-dominant pastures have become even more important than previously. The main weeds concerned are Slender, Variegated, Black, Scotch and Illryian Thistles and such annual grasses as Barley Grass. The problem is now recognised as one of high fertility in the soil, requiring to be utilised by either perennial grasses or crops.

St. John's Wort.—This serious weed of central and southern districts continued to spread, particularly along roads. Except in a few areas, inadequate action has been taken to bring it under control. Chrysomelid beetles, introduced some years ago, were again very active, particularly in the Mudgee district. The Stem Gall Midge recently released was also fairly active around Mudgee. It has caused some reduction in growth and seeding.

Vegetable Section

GENERAL

Successes from Breeding Programme.—The year was marked by successes in the vegetable improvement field. A potato variety, two French bean varieties and one tomato variety from the Department's plant breeding programmes were named and released for commercial production. Release of these new varieties followed their performances in trials on farmers' properties, and their acceptance by farmers is assured.

Grading, Packaging, Marketing, Processing.—Marked interest in processing in recent years, partly influenced by supermarkets, was sustained. Advice sought by processors, entering new fields or seeking to maintain output or improve varietal quality, demanded more of the time of vegetable agronomists.

Similarly, with increasing competition from processed vegetables, demand for more knowledge in regard to grading, packaging and marketing of fresh vegetables increased.

The demand by processors for raw material has had a most beneficial effect in the Murrumbidgee Irrigation Areas. There, increased quantities of tomatoes in particular, but also peas, onions, garlic and beetroot, were produced under contract.

Research at Terranora Plot.—Co-operation with the Banana Growers' Federation in conducting the Terranora Demonstration Area has been an outstanding success. This has been so for five years. This season, at the request of the Federation, emphasis was on research rather than demonstration. Investigations of local weed, disease and pest control problems, and the testing of new varieties, have been undertaken.

Mudgee Development of Vegetable Industry.—For some years the Department has endeavoured to foster the vegetable growing industry on the alluvial flats in the Mudgee district as an alternative to the receding maize seed and lucerne growing industries. In the past season over 500 acres of vegetables grown under contract to processing firms gave good results. This confirmed the district's suitability for large scale vegetable growing.

Vegetable Research Newsletter.—The first three parts of the Australian Vegetable Research Newsletter, issued under the auspices of the Australian Agricultural Council, were published. Officers of this Department engaged in vegetable research contributed a high proportion of the articles to the Newsletter.

POTATOES

Release of New Variety—Bungama.—The white skinned seedling S 2770, selected from the cross Moona x Katahdin, was released to commercial growers under the name of Bungama. It is of mid-season maturity, with a very high yield of uniform good quality tubers. Bungama suits all except the earliest areas of the State and should largely replace the popular Sequoia variety.

Large Scale Programme of Crosses.—The crossing programme continued on a large scale as in the previous season, and 250 crosses were made—yielding over 800 seed balls.

Main female parents were Onaway, Russet Sebago, Haig, Delus, Tawa and Osage from the U.S.A., the local varieties Crana, Adina and Bungama, and the most promising of advanced local seedlings.

Male parents most commonly used were Cherokee, Merrimack, Katahdin, Redskin and Menominee from the U.S.A., and local varieties and seedlings Adina, Awaba, Crana and S 2782.

Crossing on such a wide scale over the past few seasons has enabled the potential usefulness of many parental lines to be assessed. In consequence the breeder has been able to concentrate on those parents producing superior progeny. The effect of this has been apparent in the marked improvement of seedling quality in early generations.

Potato Breeding Success

New England Agricultural Research Station, Glen Innes, is the centre of potato breeding. This year another new and outstanding variety ("Bungama") was named and released.

Here, the plant breeder is making one of the many crosses made at the Station, using parents selected for such characters as disease resistance, high yield, superior cooking quality.

Some 15,000 first year seedlings were grown in the glasshouse during the season. Parents that yielded attractive progenies included the U.S.A. varieties Delus, Merrimack, B595-76 and Redskin, and local varieties Awaba, S 2782 and Crana.

Over 2,000 second year seedlings were grown at the substation. Of these, 212 were selected for trial in the third year section next season. Some particularly outstanding lines were from the crosses 1563 (c) 14 x Merrimack, Walanga x Merrimack, 1928 (e) 2 x S 2782, and from numerous crosses with B595-76 as the female parent.

Two hundred and eighty-five third year seedlings were planted in rows varying from one hill to ten hills. Of these, 132 were selected as worth further trial. Particularly attractive lines were those selected from S 2864 x Merrimack, S 2821 x Merrimack, B595-76 x Adina, Delus x S 2782 and Placid x Crana.

From the 155 fourth-year seedlings grown at the substation, 49 selections were made. The most promising were from the crosses S 2776 x Redskin, 11-79 x Cherokee and 1521 (c) 3 x Redskin.

Forty of the most outstanding advanced seedlings were grown in a replicated preliminary yield trial. Amongst the most promising were five selections from the cross Monak x 11-79, four from Awaba x 336-123, and one each from Menominee x Redskin, Crana x Redskin, and Murru x Adina.

Breeding for Disease Resistance.—Of thirty advanced seedlings tested by the Biology Branch for resistance to late blight, six were highly resistant to the races of blight used. Resistance was derived from the American lines Cherokee and B595-76 and the Scottish line 1521-(c) 3.

Some 1,700 first year seedlings were screened for resistance to common scab by growing the plants in vermiculite previously infected with the casual organism. From these plants, 150 lines showing some scab resistance were selected. Resistance in these lines was derived from the American varieties Cherokee, Menominee, Osage and Redskin.

Potato Introductions.—Eight new varieties were introduced from the U.S.A. and Canada, and grown in quarantine. The varieties Blanca, Navajo and Bounty appeared promising.

Potato Fertiliser Trials.—In a replicated fertiliser trial of factorial design conducted at Guyra, the highest yield of 5.8 tons was obtained from the plots with 3 cwt. of superphosphate and 2 cwt. of sulphate of ammonia. The most marked effect was the yield increase with higher applications of superphosphate. As in previous years, potash had no effect.

Uniform Fertiliser Trials—Survey of District Needs.—A series of potato uniform fertiliser trials in the major producing areas provided a survey of the fertiliser requirements for each district. Results so far indicate that phosphate gives the most consistent yield increases in all areas. Nitrogen also in most areas increased yield, though this was significant in only a few trials.

In one trial at Maitland, and one at Crookwell, potash significantly increased yield when applied at 1 or 2 cwt. rate. In two trials at Singleton however, potash at these rates significantly reduced yield. In other trials, in other areas, there was no significant reaction to potash.

District Variety Trials.—Approximately 5 tons of seed potatoes, made up of ten named varieties and fourteen new Departmental seedlings, was produced at the main testing ground in Orange for distribution to twenty-nine district variety trials.

In the trial at Orange, the new variety Bungama again performed well, together with the seedlings S 2856, S 2854 and S 2848. The U.S.A. varieties Kennebec and Merrimack also produced good yields of attractive tubers.

District variety trials were at twenty-nine centres. In coastal trials, the new variety Bungama gave very good results, though it may be a little too late in maturity for the far north coast. Kennebec also showed good results in some trials. In trials on the Hunter River, Bungama and S 2854 yielded significantly more than the standard varieties Sebago or Sequoia. Bungama also gave good yields of attractive tubers in trials in Tableland areas, though in most trials not significantly superior to the later maturing S 2854.

Potato Seed Certification.—The acreage submitted for certification (1,527 acres) was similar to last season (1,560 acres) though the number of growers (136) showed a further decrease from last year's (155). The actual acreage certified (1,410) showed a slight decrease from the previous season (1,489), though the production showed an increase of approximately 6,000 bags (38,000 as against 32,000 in 1959-60).

Of the acreage inspected, 7.7 per cent. was rejected, compared with 4.5 per cent. for 1959-60. Some of the increase in rejection percentage was due to an as yet unidentified virus disease in certified crops of Sebago on the Central Tablelands.

Cooking Quality Tests.—In cooking tests conducted by the C.S.I.R.O. with nine varieties and seedlings, Sebago was placed first in overall organoleptic rating; followed by seedlings S 2851 and S 2854, and the new variety Bungama. In specific gravity tests, S 2852 was highest; followed by Murru, Sebago and Bungama.

Two private firms, one concerned with making crisps and the other with general processing, at the request of this Department undertook tests with varieties and seedlings to determine processing quality. Both firms found the U.S.A. variety Kennebec outstanding for their particular requirements. Some Departmental seedlings also showed promise for processing.

TOMATOES

Release of New Variety—College Challenger.—The new variety College Challenger, produced at Hawkesbury Agricultural College, was released in December, 1960. Developed from the cross Grosse Lisse x Tatura Dwarf Globe, it has a very good tolerance to *Fusarium* wilt and produces a high yield of fruit of excellent quality.

Breeding Programmes.—Breeding programmes were continued at Hawkesbury Agricultural College and at Yanco Agricultural Research Station. The Hawkesbury programme specifically aims to produce high yielding, disease resistant varieties, and improved varieties suitable for field and glasshouse culture. At Yanco, emphasis is on production of a dwarf variety resistant to *Fusarium* and suitable for pulping.

Good results were obtained at Hawkesbury with some selections, from the F_7 of Rouge de Marmande x L. pimpinellifolium LA 160, backcrossed twice. Of these, line 69B-1 is resistant to *Fusarium* wilt, is early maturing, has round smooth fruit and a higher yield than Rouge de Marmande.

A number of recently developed wilt resistant F_1 generation hybrids show great promise. The hybrids were Anahu, Indian River, VF-202, Kokomo and Manalucie in combination with Rouge de Marmande, Indian River x KY_1, and Anahu x Rhode Island Early.

Numerous single selections were made from the segregating wilt resistant crossbreds Anahu x Step 286, Kokomo x Rouge de Marmande (F_3) and Anahu x Manalucie (F_3).

At Yanco, six crosses in F_2, one in F_5, and four in F_6 generations were tested for resistance to *Fusarium*, and thirty-five selections showing high resistance were made. Two lines in the F_5 generation of Pan America x Moscow were tested for combined resistance to *Fusarium* and *Verticillum* wilts. Seven selections were made. These all show good resistance to the two diseases.

Tomato Introductions.—Nineteen varieties were introduced. Of these, the most promising were Indian River, Mozark, Epoch, Campbell 146, Rio Grand and VF-145 from the U.S.A., Represas from Chile and Step 286 from Hawaii.

Tomato Variety Trials.—In an observation trial of seventeen varieties conducted at Bathurst Experiment Farm, Hybrid Pennsylvania 103, Sequoia and VF-145 all from the United States performed very well.

Field tests with three varieties of canning tomatoes were conducted in the Leeton and Griffith districts of the Murrumbidgee Irrigation Area. Roma 884 was very promising in each area for both canning and sauce production, and also proved suitable for long distance transportation. 255YS performed well in the Leeton district, but when transported to Sydney from Griffith showed some break-down. These two varieties, and also a selection of M_3, showed high resistance to *Fusarium* Wilt when grown on badly infested soils.

Growth Regulators.—Further trials were conducted at Hawkesbury Agricultural College to test the ability of the selective gametocide FW-450 to induce male sterility in tomatoes. The best results were obtained with a concentration of 0.15 per cent. applied at 8-10 c.c. per square foot. Positional male sterility was induced for a period, without the appearance of female sterility.

Direct Sowing of Tomatoes.—A trial was again conducted at Yanco to compare direct sowing of tomatoes with transplanting. Eight direct sowings and transplantings were made at fortnightly intervals from 1st September onwards. Direct sowing produced a more uniform distribution of fruit supply than did the transplanting. However, total yield from the transplanted seedlings was higher than that from the direct seeded plants.

BEANS

Release of Two New Varieties.—Two new varieties produced at Hawkesbury College were released to commercial growers.

College Supreme, formerly H.A.C.23, is a selection from Hawkesbury Wonder x Granada. It is a heavy yielding variety with pods of excellent quality, resistant to halo blight and tolerant to rust.

College Early, formerly H.A.C.42, is a selection from Hawkesbury Wonder x Tweed Wonder. It is early maturing, and will crop well under cool conditions.

Bean Breeding Programmes.—Breeding programmes were continued at Hawkesbury Agricultural College and Yanco Agricultural Research Station. At Hawkesbury, the aim is to produce disease resistant stringed and stringless varieties as well as bush field bean types.

From the F_3 to F_7 generations of 11 different crossbred lines 116 new selections were tested. Some selections from Processor x College Supreme and Redlands Beauty x College Supreme showed promise. Selections from the cross (Fullgreen x Brown Beauty) x (Brown Beauty x Little Navy) were highly resistant to anthracnose and rust.

Seed of 11 genetically fixed crossbred stringless lines were increased. Four new sucecssful crosses were made between disease resistant and high yielding crossbred lines. Five lines of bush field bean crossbreds were yield tested at New England Agricultural Research Station and the shelled dry beans were tested by the C.S.I.R.O. for canning quality. All lines performed very well from the aspects of both yield and quality.

The Yanco programme aims to produce stringless dwarf and pole beans suitable for canning. Intensive individual plant selection was carried out to eliminate those lines with coloured seeds and runners from the dwarf lines. Very promising selections were made from the crosses Processor x FM-1 and Seminole x FM-1. In the pole bean hybrids, thirty promising selections were made from the F_5 generations of six different crosses.

Bean Introductions.—Eight varieties were introduced. The variety Tenderpod from the U.S.A. performed well. It gave good yields of well coloured pods of good quality. Garden Green from the same source also showed promise.

Certified Bean Seed Production.—There was a slight increase in the acreage of French beans submitted for certification, 205 acres as compared with 199 in 1959-60. Rejections were heavier. Only 128 acres were passed, compared with 165 last year.

Bean Variety Trials.—A series of five replicated variety trials was carried out over a four month period at Terranora Demonstration Area. The two varieties College Supreme and College Pride gave consistently high yields of attractive pods. The Queensland variety Redlands Beauty showed very good resistance to rust in all the trials.

At New England Agricultural Research Station, the varieties Windsor Longpod and H.A.C.32 performed best. At Bathurst Experiment Farm, Tenderpod and College Pride gave best results. Thirteen varieties were compared in two trials in the Hunter River district, and College Supreme, College Early, Redlands Beauty and Richmond Wonder were best.

In a Yanco trial of six canning bean varieties the variety Seminole yielded highest, followed by Slendergreen and Tenderlong.

GARDEN PEAS

Pea Breeding Programmes.—At Hawkesbury Agricultural College the programme designed to produce early peas of even maturity and superior canning quality was continued. The bulk seed of six segregating crossbred lines was sown, and thirty-eight new selections were made from the promising lines Super Alaska x Greenfeast, Early Dwarf x No. 75 and Early Wonder x No. 75.

At Yanco Agricultural Research Station the aim is to produce an early to mid-season variety suitable for canning. Seven lines from (Greenfeast x Massey) F_6, five from (Greenfeast x Clucas Early Dwarf) F_6 and two from (Greenfeast x Wando) F_7 were promising. They have been seed increased for yield and quality tests. Thirteen selections were also made from earlier generations in six other crosses.

Canning Pea Variety Trial.—At Yanco Agricultural Research Station there was a replicated variety trial of canning peas. Hursthouse produced the highest yield per acre of shelled peas, followed by L.99. Variety No. 40, from Asgrow U.S.A., gave the lowest yield, but very large uniform shelled peas probably suited to deep freezing.

Canning Peas—Rate of Sowing Trial.—At Yanco a replicated trial examined the effect of different plant spacings on yield. Four within-row spacings were compared, viz., ¾ inch, 1 inch, 1½ inches and 2 inches. The highest yield was obtained when plants were spaced at 1 inch. At the ¾ inch spacing, plant competition was noticeable. It depressed yields. With both the ¾ inch and 1 inch spacing, maturity was hastened by a day.

ROCKMELONS

Breeding.—At Yanco Agricultural Research Station, breeding of rockmelons resistant to both *Fusarium* wilt and powdery mildew continued. Due to the breakdown of the parents previously in use, in resistance to mildew, existing crossbred lines were tested only for *Fusarium* resistance, fruit shape and quality.

An F_2 line of the cross (P.M.R.5 x Rio Sweet) F_1 x Delicious 51 showed good resistance to *Fusarium* and produced good quality fruit almost identical to P.M.R.45. An F_3 line of P.M.R.5 x Spartan Rock and an F_3 of P.M.R.6 x Spartan Rock each showed good resistance to *Fusarium and* moderate resistance to powdery mildew.

To find material with resistance to powdery mildew (*Sphaerotheca fuliginea*) some lines were introduced from the U.S.A. Many of these came originally from India. Nineteen lines proved to be immune to the powdery mildew, and some of these are being used as parental material though they are not suitable agronomically. Crosses have been made with P.M.R.5, Edisto, Delicious 51, Harvest Queen and L.J. 39781.

Introductions.—Fifty-seven varieties were introduced, most for use in the search for parental material. Of the commercial lines introduced, Harvest Queen from the U.S.A. showed most promise. The variety L.J.39781, introduced in the previous season from U.S.A., once again performed well. It was quite free of powdery mildew.

CAULIFLOWERS

Breeding.—The breeding programme continued at Bathurst Experiment Farm. It aims to produce more vigorous high yielding early types, with better curd protection and disease resistance. The cross Frickers Original x Russian 2A was promising. It was early and very vigorous, with good solid white curds and good curd protection. Other crosses to perform well were Selandia x Early Snowdrift, Novo x Danish Giant and Codania 101 x Frickers Original.

Cauliflower Fertilizer Trials.—In a replicated fertilizer trial of factorial design at Bathurst, the plots were split for application of boron at 14 pounds per acre. Potash and boron at high levels each significantly decreased the number of marketable heads. The highest yields were obtained from plots testing 4 cwt. of superphosphate combined with 6 cwt. of sulphate of ammonia.

Introductions.—Five new varieties were introduced, and tested at various centres. Of these and previous introductions, Danish Giant from Canada again performed well, as did Danish Export No. 7 and Progress.

BRUSSELS SPROUTS

Improvement Programme.—At Bathurst Experiment Farm the programme designed to produce early maturing hybrids with resistance to *Sclerotinia* rot continued. Some of the hybrids produced in this programme were in two observational trials in the Bathurst district, together with introduced varieties.

The varieties Yatesco Hybrid from Arthur Yates & Co., and Long Island Strain 32 performed well. The most promising of the locally produced hybrids were an F_1 of Amager Improved x Catskill and an F_2 of Fillbasket x Catskill.

CABBAGE

Introductions.—Five new varieties of cabbage were introduced from Denmark and tested at Hawkesbury Agricultural College. Of these, the two varieties Golden Acre AL 145 and Copenhagen Market showed promise.

Fertilizer Trial.—In a fertilizer trial at Bathurst Experiment Farm, highest yields were obtained from high rates of superphosphate applied with high rates of sulphate of ammonia.

BROCCOLI

Introduction on Trial.—The one variety of sprouting broccoli introduced during the year was Spartan Early, from Michigan. In a trial at Hawkesbury Agricultural College, this was outstanding for its very early and concentrated maturity.

CAPSICUM

Selections from Introduced Breeding Lines.—A number of capsicum breeding lines originally from Hungary have been grown and progressively selected over the past three seasons. These are of the "Banana" group, creamy yellow in colour and smaller than the ordinary green types.

Several selections of the lines C.11.0_2, 0_4 and D11 have shown great promise. They are very uniform in appearance, very vigorous, and have a prolonged high yielding capacity and excellent eating quality.

CUCUMBERS

Breeding from Introductions.—Plants of the breeding line No. 108-3PF introduced from Michigan, which possesses the gynomonoecious habit, and of its crossbreds, were grown for observation in the spring of 1960, and the summer of 1961. Only a few plants showed a high degree of predominantly female flowers. These were selfed or backcrossed with the breeding line, and a reasonable quantity of seed was obtained.

New Introduction.—The only new introduction was Challenger from the United States of America. Grown at Hawkesbury Agricultural College it showed good resistance to mildew, but the fruit is a little too large for commercial requirements.

ONIONS

Breeding and Introduction Programmes.—Breeding programmes were initiated at Hawkesbury Agricultural College and at Bathurst Experiment Farm. They aim to produce a hybrid onion variety for local production. A nucleus of material was directly and indirectly introduced from the United States of America and is being used in conjunction with local varieties Hunter River Early White and Hunter River Early Brown.

Of the introductions tested at Hawkesbury, Early Harvest from the United States of America showed promise, though susceptible to downy mildew.

CARROTS

Variety Trial.—In a variety trial comprising 10 varieties at Bathurst, Autumn King continued to perform very well. Quality tests are being carried out on all varieties by a processing firm.

Fertilizer Trial.—In a replicated fertilizer trial at the New England Agricultural Research Station, the indications are that phosphate is the most essential requirement for carrot growing in this area.

PLASTIC MULCHES

Tests with Cucumbers.—At Hawkesbury Agricultural College the effects on cucumbers of a laminated polythene plastic and aluminium foil mulch were under observation. The mulch was compared with normal cultivation and with chemical weed control.

There was no difference between plots in the earliness of maturity, but the mulched plots showed a more even production of higher quality cucumbers. The mulch controlled weeds well, and conserved moisture efficiently.

Wheat

THE SEASONS

Seasonal conditions in 1960 were excellent for cereal crops in the central and southern divisions, but less favourable than usual in the north-west. The dry June delayed main crop sowings in the north-west, and although good rains fell in July the crops were set back by dry frosty weather in August and September—while conditions remained good in the rest of the wheat belt. October rains benefited the northern crops; but thunderstorms and showers in late November and early December disrupted the harvest, resulting in wheat deliveries being made much later than usual.

ACREAGE AND PRODUCTION

Receivals of wheat from the 1960-61 harvest by the Australian Wheat Board in New South Wales totalled 72,610,000 bushels compared to 67,073,000 bushels the previous year. Adding to this figure the quanity of grain delivered to southern silos on the Victorian railways system, and that held back by farmers to satisfy their 1961 sowing and stock feed requirements, the Commonwealth Statistician estimated that the harvest totalled approximately 83,000,000 bushels from 4,064,000 acres harvested for grain—a yield average of about 20.4 bushels per acre.

If final figures confirm the estimate the 1960-61 production will be the second highest on record. The highest was 95,226,795 bushels in 1947-48.

Local mills paid a premium averaging 25.26d. on 3,745,381 bushels. Additional, some 2,400,000 bushels, mostly of the "Gabo" type quality, commanded a premium from overseas buyers.

FAIR AVERAGE QUALITY

For 1960-61, two F.A.Q. Standards were declared, one for northern wheat, at 64 lb. per bushel Schopper weight; and one for southern and western wheat combined, at 62 lb. per bushel. In addition to the two F.A.Q. Standards, a standard was set for "off grade" wheat, at 57 lb. per bushel.

VARIETY POPULARITIES

Development of new rust races had resulted in a rapid drop in the popularity of Gabo. This until 1959 was the most popular variety grown in New South Wales. The poor quality variety Glenwari is now the leading wheat on acreage, due to its popularity in the field with farmers. The leading varieties in New South Wales, on acreage (last statistics are for 1959-60) are now Glenwari (21.1 per cent.), Bencubbin (12.4 per cent.), Gabo (12.1 per cent.), Festival (8.4 per cent.), Koda (3.9 per cent.), Kendee (3.8 per cent.), Bordan (3.5 per cent.), Sabre (3.2 per cent.), and Javelin 48 (3.1 per cent.).

WINTER WHEATS

The acreage sown to winter wheats expanded in 1960, further to the provisional recommendation of the variety Winglen, and the naming of Windebri (a sister line to Winglen). Acreage of the only other commercially grown winter wheat, Winter Minflor, declined.

Grazing and grain trials widespread in 1960 demonstrated the superiority of these new varieties over Winter Minflor. They also demonstrated that while Winglen was superior in grazing yield to Windebri, the latter recovered better for grain after grazing. Both have good baking quality.

DURUM WHEATS

The macaroni variety Dural produced by wheat breeders of this Department was grown in 1960 by many farmers on more fertile soils of the north-west. All marketable grain from the 1960 harvest commanded a premium from millers; an average premium of 2s. 6d. per bushel, for 54,937 bushels. Pure basic seed stocks of Dural were maintained by the Department for supply to selected registered seed growers. The latter in turn supplied pure seed to farmers.

BISCUIT WHEATS . .

Industry Funds for Quality Improvement Programme.—The Wheat Industry Research Committee of New South Wales allocated funds during the year for commencement of a soft-wheat quality programme, based mainly on the central and southern areas of the State and aiming to satisfy in the first instance the needs of the local biscuit and allied trades.

Quality Tests.—A co-operative project between this Department and a leading biscuit manufacturer, continued to test varieties suitable for biscuit manufacture.

Results of the quality tests from the 1960 samples from the southern half of the State, including Tableland and Irrigation areas, indicated that even at low protein levels some of the known soft wheat varieties were not suitable for soft biscuit manufacture.

Some of these samples with flour protein under 7 per cent. were even found to be unsuitable. For example, a sample of Insignia grown at Bathurst, with a flour protein of 6.7 per cent., produced a good soft biscuit flour; whereas a sample from an irrigated Pinnacle crop grown at Goolgowi, with a flour protein of 6.8 per cent., was classified by the manufacturers as too tough for soft biscuit purposes. This highlights the difficulty of selecting material for use in a soft biscuit-wheat improvement programme.

Wheat Improvement Programmes

In the South of the State.—This wheat improvement programme is conducted by the Wagga Agricultural Research Institute. Arising from the programme, a new wheat variety bred at Temora Experiment Farm was provisionally named Falcon during the year. Supplies of Falcon seed have been built up by registered growers.

Falcon, combining good field performance and yield with better baking quality than other varieties at present widely grown in the south of the State, has been included in recommendations for trial plantings over a wide area in southern New South Wales.

In the North of the State.—The first commercial plantings of the new, rust resistant Gabo backcross lines were made this year. Acreages of these varieties are expected to increase rapidly in the next few years. Their quality, in the Gabo class, is very satisfactory.

An adverse decision was made on a promising new hybrid known as 1131. It combines the rust resistance of Festival and Eureka and is superior to Festival in yield and field characters. However, milling and baking tests showed that the flour is a light yellow colour and the stability of the gluten is no improvement on Festival. Accordingly, this hybrid will not be named nor distributed in New South Wales.

Some backcross lines of Eureka with additional rust resistance from Kenya 117A were tested. They show considerable promise.

Testing of new hybrids in extension plots throughout the north-west provided valued information. Weather conditions varied greatly from trial to trial and provided a wide environmental range.

A number of new races of leaf rust were identified and found to attack the varieties Gamenya and Mengavi.

Wheat Quality Activities

Production and Marketing Committees' Reports.—The reports of the Commonwealth Production and Marketing Committees were published at the direction of the Australian Agricultural Council.

In early 1961, the Minister for Agriculture established the New South Wales Advisory Committee on Wheat Production, and Marketing, to consider problems raised by the reports and requiring special action by this State. The Cereal Specialist, who arranged preparation of the New South Wales report for the Production Committee, was appointed Secretary of the New South Wales Advisory Committee on Wheat Production and Marketing.

Milling and Baking Tests.—Valuable information on the baking quality of new material under field test was obtained with the co-operation of the Chemistry Branch, Division of Science Services.

Wheat samples from widespread wheatbelt centres were tested for milling and baking quality. For the first time, in 1960, uniform quality tests were carried out on a number of promising advanced lines and named varieties approaching the release stage. Under this arrangement five separate testing laboratories, including commercial mills, reported to the Standing Advisory Committee on Wheat on the quality of new varieties being considered for recommendation.

Competitions.—Entries in the Open wheat classes at the 1961 Royal Agrciultural Show were appreciably lower than those of the previous year. An entry of Festival, bred by this Department, secured best points for bench characters. Best bench entry in the soft wheat class was a sample of the Departmentally bred Heron. In the special Durum class, a sample of Dural, bred by this Department, was outstanding. Other varieties from Departmental breeding exhibited were Eureka, Charter, Celebration, and Winglen.

Wheat Experiments—Variety Trials

Many promising new wheat varieties were tested on farmers' properties throughout the wheatbelt in 1960. These variety trials furnished useful information on the field performance, yield, and baking quality of promising crossbreds and named varieties.

Distribution.—In 1960 (1959 figures in brackets) wheat variety trials were conducted with 54 (63) co-operating farmers working under the supervision of District agronomists; testing a total of 28 (33) varieties. In addition, wheat variety trials at Experiment Farms tested a large number of promising crossbreds and named varieties. Some very high yields were recorded, particularly in the south.

Variety Performances.—New varieties under test were Gamenya, Mengavi, Kenora, Hopps, Moora, Windebri, Beacon, Falcon, Olympic, and M.U.O. Dirk 48.

High yields were general in southern and central areas because of the good season, although storms and wind at harvest caused some lodging and shattering. Yield results in the northern half of the State were much less satisfactory, as the weather was very dry during the winter and early spring. Good late spring rains saved the situation. In fact, some late sown trials were able to take full advantage of these late rains and yielded highly. Frosts and diseases were insignificant.

Gamenya, rust resistant Gabo backcross, did very well in the north. It outyielded all other early maturing varieties. On the other hand Mengavi, another Gabo backcross, but with a different type of rust resistance, was inferior to both Gabo and Gamenya.

Kenora, a new early-maturing rust resistant Queensland variety, was not outstanding. It was inferior to Gabo, Gamenya, and Spica. Hopps, another new rust resistant variety from Queensland, but later in maturity, did poorly in comparison with the recommended varieties.

Moora, a rust resistant variety from Western Australia, was quite promising in comparison with Eureka and Warigo in northern trials, but inferior to Olympic in central and southern areas.

Windebri continued to show its superiority over Winglen in grain production.

Beacon, a sister line to Olympic, was inferior in yield to Heron and will be dropped from the trials.

Olympic and Falcon outyielded Bencubbin and Javelin 48 respectively, and should prove very popular in commercial production. Olympic is a Victorian Wheat. Falcon, bred at Temora Experiment Farm, and named during the year, produced grain of good quality.

Soil Fertility and Rotation Experiments

Condobolin Project.—This work has been at Condobolin Experiment Farm for five years. The early winter was dry but good falls of rain in late winter and in the spring resulted in good yields of crops.

As yet there are no strongly pronounced trends, but these should show up in the next few years. There is some indication that wheat yields after natural pastures are lower than after improved pastures or grazing oats.

Once again yields from the plots long fallowed were higher than from short and medium fallows.

Natural pastures produced very little grazing except where self sown oats and wheat were present. Grazing oats and lucerne produced good grazing but wimmera rye grass-barrel medic plots gave much less feed.

Installation of a dehydrator at Condobolin during the year enabled accurate measurements of pasture and green oat production.

Other Rotation Trials.—The results of a trial conducted at Trangie Agricultural Experiment Station for a number of years to test influence of time of ploughing on wheat yield and the regeneration of burr medic have been published in the *Agricultural Gazette of N.S.W.*

The trial comparing volunteer and sown pastures and their effect on the subsequent wheat yields was continued at Trangie Agricultural Research Station.

A stubble treatment trial comparing the effectiveness of a number of implements, and also the application of a nitrogen fertilizer on the preparation of stubble ground for cropping, has been concluded at Temora Experiment Farm. It was conducted for three years. The results after analysis will be published.

Wheat Fertilizer Experiments.—A series of uniform wheat fertilizer experiments was conducted at thirty-three centres. Considerable information on the nutrient requirements of wheatbelt soils has been gained since the experiments were commenced in 1959, initially at nineteen centres. The indications are that when analyses of the 1960 harvest results are completed the results will broadly conform to the pattern of the 1959 results.

FIELD COMPETITIONS

R.A.S. Competitions.—Six Divisional Championships were conducted by the Royal Agricultural Society. Field judging of most of the local and all of the Championship competitions was done by officers of this Division. Many crops (approximately 700) of a high standard were entered, in 76 local competitions. There were 767 entries in 1959 and 893 in 1958.

Winning Championship crops were: Central Slopes—Bordan, 54 bushels; Northern Division and Southern Slopes—both Gabo, 48 bushels; Western—Festival, 47 bushels; Northern Slopes—Eureka, 46 bushels; and Riverina—Glenwari, 43 bushels.

Junior Farmer Wheat and Oat State Championships.—Judging was done by the Wagga District agronomist. There were twenty-eight entries for the wheat and seven for the oat championships. Best wheat entry was a crop of Spica, at Delungra. It yielded 45 bushels per acre. Best oat entry was a crop of the Departmentally bred variety Fulmark, at Ungarie. It yielded 43 bushels per acre.

Oats

Production and Acreage.—Actual acreage and yield figures are not yet available for the 1960-61 season, but production from the 1960-61 grain crop is forecast as in the vicinity of 15,000,000 bushels of grain from 800,000 acres; a yield average of 19.6 bushels per acre. The production would be well above the 1959-60 production of 11,125,000 bushels. Total 1960 sowings of oats for all purposes, grazing, hay, and grain, were about 1,450,000 acres; compared with the record 1958 area of 1,627,000 acres. Record grain production year was also in 1958, when 27,628,000 bushels were harvested.

Variety Popularities.—Oat variety statistics for 1959-60 show that the relative popularities of varieties are changing. Belar has fallen to 40.5 per cent. of the acreage, Algerian (23.5 per cent.) is still in second place, and Dale has superseded Fulghum in third place. Burke (2.8 per cent.) and Ballidu (2.7 per cent. dropped slightly in popularity. Other varieties increasing in acreage are Acacia (2.9 per cent.), Orient (2.7 per cent.), and Fulmark (1.3 per cent.).

Oat Variety Trials.—In addition to trials at Experiment Farms, farmers' Oat Variety Trials (1959 figures in brackets) were conducted in 1960 with 32 (31) farmers; under the supervision of District agronomists, and testing a total of 22 (23) varieties.

In central and southern areas yields were mostly very good because of the favourable season, but in some cases were reduced by strong winds and heavy rains. Yields were low in many northern trials because the winter and early spring were so dry.

New varieties tested were Coker's Fulgrain, VRA W4304, Avon, Osage, Victorgrain 4, and V.R. Bke. F. x WF W4477.

Avon performed well. It withstood the stormy weather at maturity while other varieties lost grain by shattering. Victorgrain 4 was also very promising for grain production.

The promising crossbred VRAF x VRSF M1010, named "Cooba" in early 1961, did very well in the southern half of the State—for late grazing and recovery for grain.

The unnamed hybrids VRA W4304 and V.R.BkeF x WF W4477 will be dropped from future trials. The former is inferior to Algerian and the latter is inferior to its sister selection W4587.

Oat Improvement Programmes.—New England Agricultural Experiment Station, Glen Innes, is conducting breeding and selection of superior oat varieties *for the northern part of the State.*

The programme aims to develop disease resistant varieties suitable for grain only, and also dual purpose types for grazing and grain. Another character aimed at is resistance to frost damage immediately after grazing.

Preliminary yield tests were carried out at Curlewis (a grain trial) and Tamworth (grazing and grain) Stations, as well as at Glen Innes. These two trials, supervised by the oat breeder, enable new hybrids to be evaluated for the north-western slopes and the eastern portion of the plains.

A few new byrdids have been included also in trials at Pallamallawa and Moree, to test their value for the western plains. The yielding ability of new hybrids in a spring sowing is under determination at Kingsland.

Selection of plants resistant to shattering was facilitated by January conditions at Glen Innes.

At Grafton Experiment Farm the crown rust nursery was of less value than usual as the season was extremely dry till the late spring.

At Tamworth an excellent season enabled good selection to be made for resistance to lodging.

Resistance to stem and crown rusts has been combined with good grazing, grain yield and plumpness of grain. This material is now in the fifth generation.

Selection is also being made for resistance to the yellow dwarf virus, also known as red leaf. This disease attacks especially those crops sown very early in the year.

Two hybrids are at present being considered for release, viz.: V.R.BkeF x WF W4587, a semi-prostrate grazing type of Belar maturity, and V.R.Boppy Belar W4606, a late maturing type with a winter habit.

The *southern oat breeding programme* is conducted by the Wagga Agricultural Research Institute. A new oat variety VRAF x VRSF—M1010 was named "Cooba" early in 1961. This variety demonstrated in trials its ability to provide late grazing, and grain recovery, better than Fulghum. It also has stronger straw and good smut resistance. It is of Fulghum maturity.

Rate of Seeding and Fertilizer Experiment, Grazing Oats.—This trial has been running for three years. Once again significant increases in yield resulted from higher seeding rates and from applications of sulphate of ammonia. As in 1959, no significant response was obtained from superphosphate application.

Barley

Production and Acreage.—Statistics for the 1960-61 season are not yet available, but grain production is estimated as greater than in 1959-60 when 2,581,000 bushels were harvested from a record 118,000 acres out of a record total area sown for all purposes—136,000 acres. The record grain production was from 1958-59 season, when 2,922,000 bushels were harvested.

Trend to More Barley.—Barley grain production in New South Wales has multiplied many times in the last few years. Production of grain in 1959-60 (2,581,000 bushels) contrasts with a grain production average of 315,000 bushels in the ten seasons from 1945 to 1954; and area sown for grain (118,000 acres) contrasts with an average of 21,000 acres for the ten years 1945-54.

Barley Variety Trials.—These, comparing standard varieties, were conducted on farmers' properties in co-operation with District agronomists. With the earlier trials they have furnished valued information, particularly concerning yield differences between 6-row and 2-row varieties. This information has been prepared for early publication in the *Agricultural Gazette of N.S.W.*

Cereal Rye

Production and Acreage.—Latest available production statistics are for the 1959-60 season when 42,111 bushels of grain were harvested from 3,142 acres (of a total sowing, for all purposes, of 8,827 acres) for a yield average of 13.4 bushels per acre. In 1960 some high yielding crops of rye were harvested in the higher portions of the north-western slopes, but yields from northern crops were mostly below average.

Basic Seed Supplies.—Basic seed stocks were maintained; Weethalle strain at Trangie Agricultural Research Station, Strain 8 at Cowra Experiment Farm, and Black Winter at New England Agricultural Research Station.

Variety Trial.—Seed of N.I.A.B. obtained from Tasmania in the previous year was increased for experiment sowings and included in some grazing trials in 1960. It proved very late maturing for grain—compared to other commercial rye varieties grown in New South Wales, but it performed with promise in some of the early sown grazing trials.

Cereal Pure Seed Production

Supplies of pure seed of recommended and promising varieties of wheat, oats and barley were sustained by the Department and distributed through registered seed growers.

Sod-seeding of Rice

At Leeton, five years' experiments on sod-seeding of rice have shown that it lowers costs, eliminates costly cultivations, reduces the irrigations needed to help germination, leads to an earlier harvest, gives a yield comparable to that of a conventional cultivated seed bed, and of course allows the pasture area to remain in production right up to and following sod-seeding.

Foundation Seed Areas.—Foundation cereal seed sowings on eight Experiment Farms and Stations in 1960 totalled (with 1959 figures in brackets) 153 (213) acres of wheat, 55 (200) acres of oats, and 15 (18) acres of barley.

The smaller sowings in 1960 reflect the recently commenced scheme which aims at carry-over of sufficient seed in good years to permit reduced pure seed sowings in subsequent years.

Initial Selections and Preliminary Increases.—Associated with the pure seed production scheme on Experiment Farms and Stations, wheat and oats initial selections and preliminary increases were conducted at Temora, barley at Wagga, and, at New England Agricultural Research Station, some oat varieties suitable for northern conditions.

Registered Seed Growers.—In 1960 (1959 figures in brackets), 116 (114) Registered Seed wheatgrowers, under the supervision of District agronomists and using Foundation seed supplied by this Department, undertook seed increase of 20 (20) wheat varieties for sales to other farmers; 88 (90) Registered Seed oat growers seed-increased 14 (14) oat varieties; and 6 (9) Registered Seed barley growers did the same for 5 (4) barley varieties.

During the year, particulars of the New South Wales Registered Seed Scheme were supplied to the South Australian Department of Agriculture. That State is understood now to have commenced a Scheme largely based on that of New South Wales.

Maize

GENERAL

Production.—The acreage for the 1960-61 season was normal and good yields were general. Some farmers on the far north coast had better crops than for years past. Dry conditions at harvesting resulted in high quality grain, and prices were above normal.

Trends.—Increased inland interest in maize production was noticeable, reflecting a trend towards mechanical harvesting.

About 90 per cent. of the maize grown in New South Wales was hybrid. Small areas of open pollinated varieties were maintained by those interested in them from a show-competition point of view.

Use of maize on the farm where it was produced continued to increase. This noticeably affected the quantity of grain available to manufacturers. Farm use of the maize helped the returns from milk and butter production.

HYBRID MAIZE IMPROVEMENT PROGRAMME

Breeding programmes with field maize continued at Grafton Experiment Farm and New England Agricultural Research Station. Seasonal conditions were adverse for their work.

Promising new material was again tested in New South Wales and in Queensland. Hybrids G.H.128 and G.M.211 bred at the Grafton Experimental Farm continued to perform well under Queensland conditions, and in consequence the demand for seed of these hybrids exceeded the supply.

Hybrids bred at Grafton Experiment Farm occupied approximately 90 per cent. of the maize area on the New South Wales coast. The increasing popularity of the last released late maturing hybrid G.H. 128 with growers and manufacturers, drawn from its good performance, was notable.

New Waxy Starch Hybrid.—A new hybrid with waxy starch properties, N.E.H.1178 WX, was released from New England Agricultural Research Station. This is the first waxy hybrid developed in Australia, and some commercial firms have shown their interest by obtaining waxy grain for industrial tests.

Maize Leaf Blight Resistance.—Work to develop hybrids resistant to maize leaf blight (*Helminthosporium turcicum*) continued at the Grafton Experiment Farm.

Late maturing hybrids bred by the Department again proved highly resistant to the blight disease; but all early maturing hybrids proved highly susceptible.

Development of a series of crosses involving late and early maturing hybrids was attempted, with a view to producing early maturing blight-resistant lines. All available blight-resistant material from overseas was obtained, to assist production of early maturing blight-resistant hybrids for coastal maize growing.

Male Sterility Programme.—Further progress was made in the male sterility programme at New England Agricultural Research Station and Grafton Experiment Farm. Conversion, to the male sterile form, of some of the inbred lines used in the prouction of popular commercial hybrids progressed to the stage where it will soon be possible to release them to commercial producers of hybrid maize seed.

Maize Rust Work.—Maize rust investigations were undertaken at Grafton Experiment Farm. Two physiological races of the pathogen (*Puccinia sorghi*) designated races 1 and 2, continued to affect crops. Tests during the year indicated that race 2 was more widespread than was originally thought.

Tests of inbreds for rust resistance continued. Twelve inbred lines maintained moderate resistance to both races. No developed hybrid, however, has shown adequate resistance to either race of rust.

Inbreds for Commercial Seed Producers.—These were maintained at New England Agricultural Research Station and Grafton Experiment Farm. All demands for seed of inbreds were satisfied.

HYBRID MAIZE SEED CERTIFICATION

The Shand Selected Seed Co., a participant in the Hybrid Maize Seed Certification Scheme since the 1956-57 season, has withdrawn. It amalgamated with two large American seed producing Companies, and plans to expand seed producing activities outside the Certification Scheme administered by this Department. To assist progress, relatively large quantities of inbred material were imported by the Company and sown under the quarantine supervision of this Department in the Inverell-Armidale districts.

Hybrid Maize Seed Co-operative Ltd.—A marketing pool for late maturity hybrids was successfully operated by members of the Hybrid Maize Seed Co-operative Ltd. Eleven growers who broke away from the Co-operative movement increased their seed acreage, and competitive marketing of seed resulted.

Hybrid Seed Production.—Some 15,000 bushels of seed was produced, by 44 growers, from 330 acres; compared with 13,500 bushels, by 53 growers from 412 acres, in the previous season.

*Hybrid G.H.*128.—There was increasing demand for seed of the Departmental hybrid G.H.128, from commercial growers in New South Wales and Queensland. This hybrid occupied 50 per cent. of the acreage sown for certified seed production. Its good yielding ability, adaptability to mechanical harvesting, and suitability for manufacturing purposes were again apparent.

DISTRICT YIELD TESTS OF MAIZE HYBRIDS

Fifty trials for grain production were organised; and the co-operation of the Queensland Department was obtained in testing maize breeding material on the Atherton Tablelands where special disease conditions prevailed. This work, valuable to both Departments, indicated that some hybrids, and inbreds used in their development, had much value under Atherton Tablelands conditions.

Late maturing hybrids G.H.128 and G.H.134 and the mid-season maturing hybrid G.M.211 developed at the Grafton Experiment Farm continued to perform satisfactorily under New South Wales coastal conditions. They occupied the greater percentage of the commercial maize area.

Early maturing hybrids developed by the Shand Selected Seed Co. and this Department again performed satisfactorily. Increased demand from Queensland for seed of the first early maturing hybrid (D.S.28) produced by the Shand Selected Seed Co. necessitated the sowing of increased seed acreages of this hybrid.

MAIZE NUTRITION

Fertilizer and Spacing Trials.—No conclusive result was obtained from three fertilizer and spacing trials. Combinations of superphosphate, potash and nitrogen, with varying plant spacings, were tested.

Superphosphate was again the main fertilizer used in maize production. The value of nitrogen was demonstrated in some districts, but the results generally were variable and governed largely by seasonal conditions.

Molybdenum Deficiency Investigations.—These were again undertaken in co-operation with the Chemist Branch, Division of Science Services. This work indicated that the Molybdenum requirements of some maize hybrids are probably higher than for other crops and that remedial measures are necessary when producing maize seed on Molybdenum deficient soils.

Rotation Experiment.—The maize rotation experiment at New England Agricultural Research Station was continued. A summary of the results of this work over a thirty-six years' period is in process.

The University of New England has shown interest in this experiment and has been offered the use of the area for soil investigations.

MAIZE PEST AND DISEASE WORK

Weevil.—Control of weevil damage to ripening maize crops is a problem of some importance to coastal maize growers. Work done clearly indicated that field infestation can be reduced by: planting maize as late as possible, preferably after the middle of December; using varieties with a sound, well-fitting husk cover; attempting to minimise damage to the cob by birds during the growing season; and harvesting the crops, especially those planted before the middle of December, as early as possible.

Smut Resistance.—Investigations to determine the smut disease resistance of maize hybrids and inbreds were under taken in co-operation with the Biology Branch, Division of Science Services. Work in the initial year has indicated a degree of variation in susceptibility to smut, with hybrids and inbreds.

Sweet Corn

Hybrid Sweet Corn Seed.—Nineteen acres of sweet corn were produced for certification, with inbred seed supplied by this Department. Seed produced was used to sow commercial sweet corn crops by firms for canning purposes.

Testing Sweet Corn Hybrids.—Testing of sweet corn hybrids was again undertaken at Yanco Agricultural Research Station. The hybrids Iochief and Golden Cross Bantam, used commercially for the past few years, continued to be best.

Popularity of the hybrid Iochief noticeably increased during the year. This was at the expense of Golden Cross Bantam. Help has been given to the canning firm of Henry Jones and Co. Ltd. to obtain new parental material for Iochief hybrid production.

Popcorn

Acreage.—Approximately 1,000 acres were sown to commercial popcorn throughout the Armidale, Glen Innes and Mudgee districts.

Improvement Work.—Improvement work with popcorn hybrids continued at New England Agricultural Research Station. Promising hybrid material was tested. A new hybrid (N.E.P.37) was released, and sown commercially for seed purposes for the first time. This hybrid has greater popping expansion than any hybrid at present in use.

Grain Sorghum

Dry conditions retarded the growth of north-western crops and some failures were recorded before relief rains stimulated crop growth in January. Yields of 40-60 bushels were obtained from irrigated crops, but most crops under dryland conditions yielded lightly.

Advent of Hybrids.—Greater interest centred on the grain sorghum crop during the year through the advent of hybrids. Hybrids developed by the Queensland Department were obtained and tested for the first time in six areas of New South Wales. Performance of some was highly satisfactory. Texas 610, in particular, showed that it would be suitable early maturing grain sorghum for New South Wales conditions.

Improvement Programmes.—The Shand Selected Seed Co. commenced a hybrid sorghum breeding programme. Large quantities of parental material were introduced for this purpose from the DeKalb Seed Producing Company of U.S.A.

An improvement programme has been initiated at Tamworth Agricultural Research Station; with close liaison between this Department and the Department of Agriculture and Stock in Queensland to prevent duplication in work planned.

Variety Popularities.—Caprock, Redbine 66, and Alpha occupied the greater part of the area sown to grain sorghum throughout New South Wales during the 1960-61 season. Redbine 66 increased in popularity. It gave the highest yields under irrigation conditions.

Pure Seed Production.—Production of pure seed of grain sorghum varieties was undertaken at Experiment Farms and made available to producers.

Tests of Introductions.—Tests of recently introduced varieties indicated that they were not superior to released varieties already giving good results to commercial growers.

Waxy Sorghum Acreage Increase.—The area of the waxy soghum variety Waxy Combine Kaffir introduced by the Department expanded in the north-west. Leeton Experiment Farm made available 75 bushels of waxy sorghum seed for sowing.

A company interested in waxy starch manufacture entered into contract with growers in order to obtain large quantities of waxy grain; and waxy starch was used for the first time in some canned products, with satisfactory results. The trend in waxy starch manufacture was pleasing. It could lead to much expanded production.

Sorghum Almum

Extensive Areas.—Interest in *Sorghum almum* was intense. Extensive areas were again sown.

The plant was tested in practically all districts. Growth in the second year on lighter soil types, and noticeably when not in association with legume growth, disappointed some landowners. On high fertility soils the growth persistence was most marked; and, once well established, very little killing of plants resulted from severe frosting.

The high nitrogen requirement of *Sorghum almum* was again demonstrated and good growth responses were noticed from the application of 3 cwt. of sulphate of ammonia. A seeding rate of 4 lb.-5 lb. per acre appeared generally satisfactory but in the drier areas 2 lb. was sufficient.

Greatest interest in *Sorghum almum* was in the north-west and central-western regions; but promising result were also obtained in irrigation districts. *Sorghum almum* was utilised for silage and hay making with satisfactory results.

Breeding.—A breeding programme for *Sorghum almum* was continued at Grafton Experiment Farm. It was hampered by dry conditions.

Selections.—Further selections of desirable plant types were made. Earlier selections were evaluated by planting at the Trangie Agricultural Research Station. Selection of a suitable plant type with a seed colour to distinguish the seed from that of Johnson grass (*Sorghum halepense*) was no nearer to finality.

Seed Certification for Sorghum Almum.—Certified *Sorghum almum* seed was produced in New South Wales for the first time. Fourteen growers registered under the Scheme initiated by the Department. From 583 acres registered, some 80 tons of seed was harvested. The Scheme was confined to the Shires of Boomi, Boolooroo, Yallaroi and Namoi. A *Sorghum almum* Seed Growers' Association has been formed within those Shires.

Sweet Sorghum

Increase for Ensilage.—The sweet soghum crop again played a valuable part in the feeding programme on many coastal farms. Its use for ensilage has increased, helped by the extended use of forage harvesting machinery.

Sweet Sorghum Seed Certification Scheme.—The area of sweet sorghum registered for certification was comparatively small, due to seasonal conditions. Only seven growers participated in the Certification Scheme. They produced about 1,000 bushels from 26 acres; compared with 1,500 bushels from 54 acres in the previous season.

Variety Popularities.—The varieties Saccaline and Early Orange occupied almost the entire area sown to sweet sorghum in New South Wales. Little interest was shown in the once popular variety White African. It has an inherent weakness in field germination.

Forage Sorghum Hybrids

Male Sterile Lines Effect.—With the availability of male sterile lines of sorghums, greater emphasis has been placed on the production of new sorghum fodder crops.

"Sudax".—The Shand Selected Seed Co. imported parental material and produced approximately 800 bushels of seed of a new hybrid forage sorghum known as Sudax. Sudax has been grown in U.S.A. There, it is claimed, it yields higher than other forage sorghums at present in use.

Sudan Grass

Improvement Work.—This proceeded at Tamworth Agricultural Research Station. Selection work with the sweet Sudan S.S.6 strain continued.

Forty-nine selections were made from 327 lines sown. Nine of them were classed as early maturing, 31 as midseason, and 9 as late maturing. Most impressive lines were among the late maturing group, and bulk sowing of these lines is now envisaged.

Sweet Sudan grass srains S.S.6 and Lahoma were compared at the Tamworth Agricultural Research Station and in the Moree-Inverell district. There was no significant difference in the yielding ability of these two varieties, but Lahoma showed distinct promise.

Broom Millet

Improvement work in broom millet at Bathurst Experiment Farm has been discontinued. Seed improvement work has been commenced in the district.

Fodder Millets

Variety Tests.—Two Pearl millets, Starr and Georgia Hybrid No. 1, were compared with the variety Japanese. The Pearl millets had a better recovery after grazing, and growth was sustained over a longer period.

An attempt was made to seed increase Starr Pearl millet, to make this variety available to landowners. Due to seasonal conditions, little success was obtained.

Cowpeas

Record Acreage.—The acreage sown to cowpeas in this State was the best ever, and record areas were harvested for seed purposes. The variety Poona continued to occupy the area sown.

Variety Tests and Seed Production.—New, disease resistant varieties, Havana, Malabar, Blackeye 5 and Santiago, were tested. They proved their suitability for coastal and inland areas, and small seed quantities of these varieties were produced.

Vetches

Interest in the use of the vetch crop was maintained, particularly on the north coast; but the acreage sown to it was 40 per cent. less than in the previous season. This was due to a 50 per cent. increase in seed price, and 10-15 per cent. increase in price of fertilizer used.

Seed Production Steps.—The failure of Tasmania, for the second year in succession, to fill our seed requirements, necessitated attention to local seed production. Over 100 acres were sown for seed production investigations for the first time. The sowings were in the Mudgee, Quirindi, Glen Innes, Orange and Tumut districts.

Rice

Acreage Increase.—In 1959-60, 49,988 acres of rice were sown, 3,000 acres less than in 1958-59, but in 1960-61 the rice area increased again—to 52,208 acres.

Terms governing the settlement of a large proportion of Coleambally irrigation area provide that farmers shall be allowed to plant 60 acres of rice annually. Thus the total area sown to rice in New South Wales will increase substantially in the coming years. Surplus production could become a serious issue unless the implied marketing problem is solved by improved quality.

Breeding Programme.—Rice breeding continued at Yanco Agricultural Research Station. The aim is a better quality variety, to replace the present short grain Caloro II.

A strain of Blue Bonnet, a long grained variety introduced from U.S.A. many years ago, has been reselected. Sufficient pure seed of this variety has now been harvested to sow a considerable area of commercial rice during the coming season as well as to provide for further pure seed increase for 1962-63 sowing.

The crossbreds Caloro 11 x Blue Bonnet 50 and Blue Bonnet 50 x Calrose showed a good deal of promise in the F_1 generation. New crosses were made, but were lost because of disease outbreak in the glasshouse.

Exchange of Crossbred Material with California.—Arrangements have been made for an exchange of early generation crossbreds with Biggs Experiment Station, California. The first exchange will be made in the summer of 1961-62.

Rice Sun-Cracking Investigations.—Rice is susceptible to mechanical breakage during milling; severity varying between varieties. The proportion of broken grain may be greatly increased where the rice has been sun-cracked. Sun-cracked and broken grain is only used for such cheaper, subsidiary products as starch and rice flour. Methods to overcome this difficulty are under investigation.

The sun-cracking influence of harvesting at a high moisture content has been tested. Tests have shown that the usual, uneven drying of the grain in the field directly influences the percentage of sun-cracked grain in discard afer milling. As a result, farmers are now trying to harvest at a high moisture content. They are combining this with bulk truck harvesting and delivery of their grain.

This year, daily sampling of nine district crops has been done for six weeks. Results of the laboratory processing of the samples collected are not yet available.

Fertilizer Experiments.—Three district fertilizer trials were carried out, at Tullakool, Deniliquin and Coleambally. The Tullakool and Deniliquin trials suffered from cold spring weather, and emergence was poor. On the Wilbriggie soil type at Coleambally, rates of sulphate of ammonia up to four cwt. per acre increased yield in a linear fashion. Addition of superphosphate did not significantly alter the results.

Variety Trials.—In the trials of mid-season varieties at Yanco Agricultural Research Station, Caloro II yielded 13 per cent. more than the next best of five other varieties. Calrose and Caloro Section 48-1 were the best of the early varieties. In the mid-season trial, their yield was comparable to but slightly lower than that of Caloro II.

Chemical Control of Barnyard Grass in Rice.—Five herbicides were tested, each at two rates. CIPC, TCA, and STAM F34 were outstanding. Influenced by a late sowing and high soil temperatures CDAA also showed promise.

Tobacco

The Mould-Resistant Hybrids Further Tested.—A further series of Commonwealth-wide tests was conducted with the mould-resistant hybrids produced by the Department.

In New South Wales they were again tested by commercial tobacco growers; also on the Mann River Sub-Station, and on six sites along the New South Wales coast—Kyogle to Bega.

In addition manufacturers tested the leaf.

Release of Hybrid to Growers.—One of the new mould-resistant strains will be released by the Department in time for the coming planting season. Leaf quality of this new strain is comparable to that of the popular commercial variety Hicks. In the current year's sales, growers co-operating in field tests have sold leaf of this resistant line, at prices higher than those received for Hicks.

A limited release of the A2 mould-resistant hybrid was made to nine growers, on a wide range of soil types. This step produced at least 16 tons of cured leaf for manufacturers.

Seed Production Nursery Set Up.—A special Seed Production Nursery was set up at the New England Agricultural Research Station to hand-pollinate tobacco plants. This is for production of seed of the A1 and A2 strains for possible release to growers in the forthcoming season. At least 15 lb. of A2 seed will be obtained.

All wild species were also seed-increased, to maintain a viable seed collection.

Industry Funds for a Tobacco Experiment Station.—To establish a Tobacco Experiment Station in the Ashford district funds have been provided by the Commonwealth Tobacco Industry Trust Account. The Station may be established in the present financial year. It has been difficult to obtain adjacent to the township of Ashford a suitable site with adequate water available for irrigation.

Industry Funds for a Research and Extension Officer.—A graduate research and extension officer for work among tobacco farmers has been appointed, on funds made available by the Commonwealth Tobacco Industry Trust. He is undergoing in-service training at New England Agricultural Research Station.

Tobacco Breeding Success

Progeny from this Bathurst Experiment Farm tobacco line, successfully bred for blue mould resistance, are now being field tested in all States. Two tons of leaf have been supplied to tobacco processors for manufacturing and smoking tests. Seed of the selected hybrid will shortly be released. Some farmers have already grown it in trials.

Linseed

Increased Farmer Interest.—Linseed continued to interest farmers. Not only cereal growers but also irrigation farmers in the south west, and on the Lachlan and Macquarie rivers, are now planting this needed crop.

Effect of Price and Yield Instabilities.—Previously, instability of the price to growers, and poor yields, have limited linseed's progress as a New South Wales crop.

Linseed price has fluctuated between £90 and £45 per ton in the last fifteen years. Over the last four years, it has stabilised at £70 per ton, and so the price instability handicap to progress seems to have been removed. The more stable price has accentuated farmers' interest, and their efficiency as growers has increased in keeping. Crops of 15 bushels per acre were formerly rare, but in the past season farmers produced 21 bushels per acre by good farming methods.

Breeding Programme.—Breeding for response to Pasmo disease continued at New England Agricultural Research Station. Selections were made for disease resistance and strain purity. A further generation of crosses was tested. Seed renewal was continued in the varietal and crossbred collection. Single plant progenies were harvested separately to obtain seed of varieties for commercial production.

Cotton

Commercial Sowing at Forbes.—A significant highlight was a commercial sowing of some 160 acres by Australian Estates Ltd. at their Jemalong property, Forbes. A third of this area was severely affected by a neighbouring farmer's herbicide spray operations, but in excess of 1,500 lb. per acre of seed cotton was yielded by the unaffected 100 acres.

Wide-spread Farmer Interest.—Farmers wide-spread in the north and in the southern irrigation areas, and those farming with irrigation plants on the Lachlan, Macquarie and other mid-western rivers, are displaying keen interest in cotton as a potential irrigation crop.

Cotton Research

Yields Under Irrigation.—Investigations continued at Narrabri Experiment Farm and Yanco Agricultural Research Station.

Yields at rates of more than 4,000 lb. of seed cotton per acre have been obtained under irrigation at Narrabri Experiment Farm; and the fibre quality is up to the standard and length required by Australian cotton spinners.

Southern Need of Early Maturing Varieties.—At Yanco Agricultural Research Station the need to develop early maturing varieties, to suit the comparatively shorter season of these southern irrigation districts, has been shown.

Selective Gametocide FW-450.—FW-450 tests at Narrabri Experiment Farm aim to evolve a technique for commercial production of hybrid cotton seed. Application rates and frequencies are under trial. Evaluation of the techniques will only be reliable after the first generation has been grown. It is too early yet to forecast the outcome but it appears that the project will be a success. Progress observations indicate that the more effective treatments have reduced to less than 1 per cent. the flowers producing pollen.

Irrigation Methods.—Furrow irrigation proved more manageable than border check. Late irrigation was shown to delay maturity.

Fertilizer?.—Although the results have not been fully analysed, observations indicated no significant yield increase from use of fertilizers. Nitrogen application possibly reduced yields slightly.

Chemical Control of Weeds.—Experiments demonstrated Diuron and possibly Monuron as promising for chemical weed control in cotton.

Soya Bean

Potential for Irrigation Farms.—Soya bean has a potential for irrigation farming. In the U.S.A. it ranks fifth among the cash crops grown; 25,000,000 acres were planted there in 1958. Because of the pressing Australian need for a high protein concentrate this crop should command the attention of our farmers.

Since soya bean can be grown and harvested mechanically, its production in the irrigation areas need not be expensive. The costs would leave a good margin of profit.

Research Attention.—The Department has carried on research and experiments for many years and latterly, in co-operation with the C.S.I.R.O., has been testing new varieties bred for Australian conditions. Yields of 18 to 20 bushels (60 lb.) per acre are current at the Leeton and Narrabri Experiment Farms; under irrigation. Re-produced commercially, that yield rate would be very profitable.

Ramie

Work with Ramie continued. Trial plots have been established at Yanco and at Narrabri. It is now apparent that the Ramie plant must have a humid climte, for best results.

Previously, propagation has been from cuttings and clones. Some 30 lb. of seed has now been collected and attempts will be made to propagate the plant from seed.

Giant Lily (*Doryanthes excelsa*)

Fibre Crop Potential.—Giant or Gymea Lily is a native wild plant prevalent on the central and south coast; and long known to possess a strong, high quality, usable hard fibre. Tests by the Department have shown that it has an extremely high fibre yield and the quality of the product is more than comparable to that of sisal.

Research.—The plant grows quite profusely in its wild state, but until now there has been no investigation of its field characteristics. These are now under examination but it is a long-term project.

Already, propagation from seed has been shown to be not difficult but the plant's growth is very slow.

Opium Poppy

Testing Commercial Production.—During the war the possibility of producing opium poppy on a commercial scale here was tested. The results were encouraging, but the project was later suspended because of difficulty in persuading farmers to grow it in preference to profitable crops with which they were already familiar.

Trial Area, Yanco.—In the past year the Department co-operated with a firm from Edinburgh, Scotland, to test the potential of opium poppy grown under irrigation in the south-west.

An acre of an Australian-bred variety ("Australian 2663") is growing at Yanco Agricultural Research Station. Specimens are to be analysed for percentage production of alkaloids and opiates, and their quality.

Irrigation Section

INCREASED FARMER ATTENTION

The dry summer of 1960-61 increased irrigation practice, particularly in the north and north-west. There, many new installations of spray irrigation occurred.

In recent years farmers with spray irrigation plants or with flood irrigation systems have increasingly realised that stability of production and income is more assured by more continuous resort to their irrigation facilities, instead of regarding this as an activity mainly for restricted rainfall periods. Even in north coast areas more favoured in terms of rainfall total there has been increased use of irrigation, to overcome the production decline in the usual "dryish" spring months.

There was a constant demand for advice by District agronomists and the Special Agronomist (Irrigation) on irrigation matters, drainage and water supply throughout the year. Advice was given by way of press notes, radio broadcasts, field days, direct contact with farmers, correspondence and telephone.

More farms were made available for settlement in the developing Coleambally Irrigation Area. This Department assisted the Water Conservation and Irrigation Commission in subdivision and farm design and gave advice to the incoming settlers through the Griffith District agronomist, and the South-Western Regional office.

IRRIGATION SCHOOLS

Forbes School for Farmers.—Further to the two successful irrigation schools for farmers at Wee Waa, a similar school was organised and held at Forbes.

Such schools show promise of becoming a frequent feature of Agricultural Bureau Divisional Councils' activities, and are being organised jointly with the Department's Regional offices and with help from specialist officers of the Department. Organisation is in hand for a similar irrigation school at Muswellbrook, and another (residential) at Yanco Agricultural Research Station in 1961-62.

In-Service Schools for Officers.—The success of irrigation training schools for officers of the Department has led to the organisation of an advanced irrigation school for selected officers of the Divisions of Plant Industry and Horticulture, to be held early in 1961-62.

Instructional Personnel Resources.—For all of these schools, much of the lecturing and demonstration has been done by experienced officers of this Department with specialist assistance in certain fields by officers of the Water Conservation and Irrigation Commission. For the advanced in-service school ready co-operation is forthcoming from the C.S.I.R.O. and the University of New South Wales. Their help and that of the W.C. and I.C. is gratefully acknowledged.

IRRIGATION AND ALLIED COMMITTEES

Blowering Dam Investigation Committee.—No meeting was held, but the Special Agronomist (Irrigation) had a number of discussions with members and the Executive Officer on matters to be included in the Committee's second report to the Minister for Conservation.

Development of Irrigation Districts (Water Allocation).—Two meetings of the inter-Departmental committee were held. The report of the Committee was finalised and presented to the Water Conservation and Irrigation Commission.

Farm Water Supplies Act.—The Water Conservation and Irrigation Commission refers applications for advances in excess of £1,000 to this Department for reports on the economics and improved production potential. Sixty-two new cases were dealt with, and others from the previous year were finalised. Many other applications, either under £1,000 cost, or where no advance was involved, were discussed between the Water Conservation and Irrigation Commission officers and this Department's Special Agronomist (Irrigation).

Hunter Valley Conservation Trust.—Thirteen meetings were attended by the Special Agronomist (Irrigation). He was appointed to three sub-committees of the Trust.

Hunter Valley Flood Mitigation Act.—No meeting of the Assessment Board was held, but there were discussions between officers of the Water Conservation and Irrigation Commission, Public Works Department, and this Department, regarding methods to determine compensation for certain crops and land as provided for under this Act.

Spray Irrigation Equipment Standards.—The Drafting Sub-Committee of the Standards Association held twelve meetings attended by the Special Agronomist (Irrigation). He also undertook a considerable amount of literature-research and study to assist the Committee's work.

Water Research Foundation of Australia.—It formed a New South Wales Committee in which the Department is represented. Three meetings were attended, and the Department's representative has been appointed to the Research Sub-Committee of the New South Wales Committee.

DIVISION OF HORTICULTURE

Regulatory Services

IMPORT INSPECTIONS

Plants and plant products from overseas were examined for the Commonwealth Department of Health in accordance with the Quarantine Act.

Seed.—Grass and clover seed imports amounted to 28,821 sacks, as against 21,158 last year. Most seed came from New Zealand. It was mainly rye grass and clover. A total of 709 sacks was found to contain weed and/or prohibited seed and required cleaning. Some lines were infested with insects and were fumigated before release to growers.

Importation of flower and vegetable seed, excluding pea seed, was considerably greater than the previous year; in all, 27,481 lb. of flower seed and 125,974 lb. of vegetable seed. Most was from the United States of America. Some came from Holland, New Zealand and the United Kingdom.

Nursery Stock.—Nursery stock importations were about the same as last year. They comprised 7,895 orchids, 7,814 bulbs, tubers and rhizomes, 2,874 ornamental plants, 3,011 rose budding eyes, 95 sugarcane cuttings and 20,000 lily of the valley pips. In some consignments, insect infestations, such as scale, mealy bugs, mites, ants, etc., were found and treated. In other lots, diseased plants were found. These were either destroyed or returned to the country of origin.

Sirex Wasp.—Inspection was maintained on all overseas wharves. Cases and wooden crates containing general merchandise were examined for Sirex Wasp and other wood-boring insects. The overall quantity quarantined is less each year, indicating greater care in selecting borer-free timber for manufacture of cases.

Passengers' Baggage.—Overseas vessels were met for inspection of prohibited plant material. Infested goods were detained for treatment or destruction.

Parcels Post.—Daily at the Parcels Post Office all parcels and packages received from overseas containing or suspected of containing plants or any form of plant material subject to quarantine control were inspected. The number of parcels submitted for examination totalled 9,701 and 1,949 were detained for further examination, treatment, or destruction. The contents of parcels detained consisted largely of plants, bulbs, seeds, peanuts, herbs, popcorn and raw cotton samples.

Timber.—Importations in log form and sawn amounted to 228 million super feet, an increase of 28½ million over last year. More than half was oregon from North America; most of the remainder came from New Zealand, Malaya, Borneo and Indonesia. Borer infestation was extremely light. An occasional small lot was held for treatment.

General.—A wide range of plant material subject to quarantine inspection was discharged from overseas vessels. The principal imports were copra, peanut kernels, seeds, canning beans, cocoa and coffee beans, bamboo ware, beverages, raw cotton and spices. A considerable quantity of some of them was treated under supervision prior to release.

EXPORT INSPECTIONS

Wheat.—In the period January to June, 1961, International Health Certificates were issued for export of 461,275 tons of wheat, 292,772 tons loaded at Sydney, on twenty-six ships, and 168,503 tons loaded at Newcastle, on nineteen ships. The countries to which the wheat was shipped were: China 357,311 tons, Basra 31,486 tons, South Africa 39,910 tons and Egypt 32,568 tons. Practically all wheat was loaded in bulk from the silos into the holds. Inspection was done at the silos at the point where the wheat travels along endless belts; an almost continuous process of drawing samples and sieving the grain for the detection of insect infestations, during the entire loading of each vessel. In many shipments considerable wheat was rejected for insect infestation.

Fruit, Seed, Flour, Rice and Oats.—These exports were inspected for the Department of Primary Industry under the provisions of the Commerce (Trades Descriptions) Act.

Citrus Fruits.—A total of 10,977 cases of Navel oranges was exported; 9,768 bushels to Singapore, 500 bushels to Colombo and 691 bushels to New Zealand. A total of 13,269 cases of Valencias was exported; 10,416 to Singapore, 400 to New Zealand, 800 to Hong Kong, 1,353 to Mauritius, and 300 to Aden.

Apples.—Shipments of New South Wales apples totalled 14,776 cases; 13,519 Granny Smith and 50 Cleopatra to the United Kingdom, 507 Granny Smith to Hamburg, and 700 Granny Smith to Hong Kong. Also shipped through the port of Sydney were 39,226 cases of Queensland grown apples; 38,977 Granny Smith and 249 Jonathan. In addition, there were 2,903 cases of various apples from interstate sources shipped to Fiji. The shipments of New South Wales apples were small because of crop failures and hail damage.

Rejections of New South Wales Granny Smiths were heavy at 2,431 cases. Main reasons were spray residue, bruising, San Jose scale and immaturity.

Pears.—A total of 5,782 cases of Packhams Triumph pears was shipped to Singapore. These were excellent, and well packed; though 500 cases were rejected for excess blemish.

Island Fruit Trade.—There were constant shipments of fruit in season to Borneo, New Guinea and the Pacific Islands. These totalled 28,405 packages; 2,777 of apples, 2,090 of pears, 9,021 of oranges and 14,607 of miscellaneous fruits.

Weed Control by Plastic Sheets in Strawberry Beds

At Narara Experiment Station the efficiency of polythene plastic sheeting for weed control has been shown. The beds in this photo are on the double-row system and covered with black polythene plastic sheeting ; with straw mulch along the paths.

Seed.—A total of 7,910 sacks of seed was exported to the United States of America, New Zealand, Japan, France and Italy. This trade included paspalum, subterranean clover, millet, prairie grass, Phalaris, Canary, Rhodes grass and palm seed.

Rice.—The 37,371 tons exported went chiefly to the United Kingdom, New Guinea, the Pacific Islands, Hong Kong and Canada.

Flour.—The 191,517 short tons of flour exported from Sydney was 19,929 tons more than last season. Main destinations were Colombo, Red China, Borneo, Malaya and the Pacific Islands. Infestation was rare, and only a few truck loads in January and February were stopped from shipment.

City Markets and Interstate Supply Inspections

From inspections of the Metropolitan and Newcastle markets to ensure compliance with the Plant Diseases Act, 19 prosecutions and 377 letters of warning were issued.

Apples.—Heavy supplies of apples for the 1960 crop were marketed until late in the season from Victoria, South Australia, Tasmania; also fair New South Wales quantities from Batlow, Orange and, to a lesser degree, the M.I.A. Ice scald was very prevalent in Granny Smiths from all places. Tasmanian Democrats were heavily affected by stem-rot, and many consignments required repacking before sale.

Orange and Batlow fruit was damaged by hail and marketed mostly under the lower grades. New season fruit, in fairly heavy supply, showed a big percentage of small fruit. Parts of many districts had suffered severe hail damage. Much of the interstate fruit was similarly affected. M.I.A. Granny Smiths marketed early were immature. They sold as cooking apples. Orange and Batlow fruit, apart from hail damage was quite good. Due to skin blemish a big percentage of it is being marketed under "Good" grade. In the heavy supplies of Jonathans and Rome Beauty from Victoria and South Australia, the larger Jonathans had very limited life.

Pears.—Fair supplies of medium to small pears came from Victoria. Towards the end of the season the bulk was poor quality, and unattractive due to severe skin blemish. Fruit of the 1961 crop from Victoria was in heavy supply and mostly high quality. Orange and Batlow pears were in moderate supply. This fruit was large and in excellent condition.

Oranges.—Testing for maturity of Valencias was done from the start of the season and until the fruit from later districts met the required standard. Less than 500 cases had to be withheld from sale due to immaturity.

Early new season Navels from Queensland and local coastal districts met an almost unprecedented demand due to scarcity of oranges. A strict maturity check was maintained. The result was very gratifying; less than 100 cases withheld due to immaturity.

Lemons.—Queensland Meyer lemons were in heavy supply, of excellent colour and mostly special grade. This lemon lacked keeping quality, and a number of consignments needed repacking if not sold within a few days of arrival at the market. Local lemons were in moderate supply at the end of 1960 and the beginning of 1961. Most were marketed as "Plain", because of scale and verracosis.

Mandarins.—The local crop was heavy. Much of the fruit was very small and some lines were hard to move. Ellendales from Queensland were mostly large, of good colour, and attractive.

Grapefruit.—Most of the grapefruit was South Australian grown and very good quality.

Peaches.—Early local peaches were mostly small and hard green. As the season progressed the general quality and size improved greatly.

Plums.—The market was heavily supplied with small Santa Rosa and Wilson plums. Narrabeens, later, were of really good size and quality. A good crop of Angelinas was marketed. These too were of good size.

Nectarines.—These were in very light supply. Condition and quality were good.

Apricots.—Supplies of small half-green apricots were at first received from Kurrajong, but quality and size improved quickly and a good crop was marketed. Good supplies of large, well-coloured, quality fruit came from the M.I.A. and South Australia.

Bananas.—Supplies were heavy in the summer and of high quality.

Pineapples.—Supplies were moderate. Repacking, for blister, was necessary in only a few consignments.

Grapes.—A good crop was marketed from all grape growing districts. Quality was fair to average. Maturity standard was closely watched in the early marketing from all areas.

Fruit Fly Condemnations.—Infestation this year was extremely light. Only 289 cases were condemned at the City Markets.

Potatoes.—Supplies came from Victoria, Tasmania, South Australia, Queensland and New South Wales. Interstate potatoes were of good quality. Little trouble was found until near the finish of the crop, when a few consignments showed moth infestation. Grading, branding of bags, and general presentation were good.

New South Wales potatoes, although not quite up to the high standard of most interstate supplies, showed in the main a marked improvement in marketing. Grading, quality, and branding of bags has vastly improved.

DISTRICT AND SUBURBAN INSPECTIONS

Fruit Fly Control Campaigns.—Fruit fly remained widely distributed. It occurs everywhere in the State except the lower Murray River areas. In conjunction with the Victorian Department of Agriculture, the Euston check point was continued. It was expanded to provide a twenty-four-hour per day service from 1st October to 31st May. In this period, 199,855 vehicles were inspected and 10,523 lots of fruit intercepted; although only fourteen instances of fruit fly infestation were recorded. Arrangements are in hand to extend this inspection service, on a "daylight hours" basis, for the entire winter of 1961.

At Wentworth a "daylight hours" check point was set up from December, 1960, to 31st May, 1961, and the twenty-four-hour inspections were provided for Christmas, New Year and Easter weekends. Some 17,666 vehicles were inspected and 608 lots of fruit were intercepted. No confirmed instance of fruit fly occurred. Cost of this check point was shared between the Victorian Department of Agriculture, the Mildura and District Citrus Association, and this Department.

A new approach to control procedure was introduced in the M.I.A. and adjoining towns of Narrandera and Hillston as a result of discussions at Leeton with industry and local government organisations. Financial and practical co-operation of these organisations made possible an overall bait spray treatment at regular intervals in five towns throughout the season. A misting machine, operated from a truck, systematically covered the whole area. This treatment was supplemented by close grid-distribution of the new male attractant lure over each area, and by appropriate supervision of regulatory requirements.

These operations have given encouraging results. For example, at Narrandera there was no local report of infested fruits last season and only one adult fly was found in a recovery trap. This is an extreme contrast to the previously annual summer experience in that town. There, in recent years, the fly has been annually recorded in epidemic proportions. The town of Leeton also recorded an epidemic in 1959-60, but the fly was not recorded in the 1960-61 season.

These encouraging results have warranted extension of the treatment programme to Broken Hill and Menindee from January to April. Local government and industry organisations subscribed sufficient money (£600) to finance a seven-treatment programme for this period. Results will be reflected in next season's incidence of fly.

The Department has supplemented the Broken Hill-Menindee campaign by appointing a Fruit Inspector to Broken Hill, to direct and supervise the programme and police the Plant Diseases Act regulations. Broken Hill-Menindee is an important area, requiring eradication methods, in view of the close relationship with South Australia and the fruit areas of Victoria and New South Wales on the lower Murray River. It is hoped that the treatment programme will be repeated in 1961-62.

In addition, Division of Horticulture will co-operate with C.S.I.R.O., Union Carbide Pty. Ltd., and this Department's Entomology Branch, in a large-scale programme of research into town treatments in the Far West next season. The use of Protein hydrolysate and Malathion sprays, male attractant lures, and individual trials of each material, have been programmed. Should these trials confirm the expectancies, the way will have been paved for the as yet most effective attack on this pest.

Treatment of bananas with Lebaycid and Rogor 40, to sterilize against possible fruit fly infestation, has been an interesting development. So far the treatment has been completely successful. The question of residual toxicity is now being determined in co-operation with the manufacturers and the Department of Health. If safety of this process is confirmed, an appreciable new outlet for bananas will be available in the Murrumbidgee Irrigation Areas. Also, the banana industry problem of mixed-ripe fruit on interstate markets will be relieved.

Investigation of fruit fly sterilization methods with citrus has continued at Gosford Citrus Wastage Research Laboratory. Promising progress has been made.

Citrus Gall Wasp Inspections.—Thorough inspections of citrus nurseries are being repeated this winter, including the metropolitan and County of Northumberland (Gosford) areas. This project has been hampered through commitment of field staff to wheat export inspections.

Potato License Inspections.—Field checks on grower licences under the Potato Growers Licensing Act were made, to good effect.

Banana Bunchy Top Control Scheme.—The Scheme operating in conjunction with the Banana Growers Federation has reduced the incidence of bunchy top to a minimum irreducible by present methods. Steps are now being taken to examine, for practicability, means of complete eradication.

Incidence of bunchy top over the past three years has been as follows:—1958-59: 2,692 infected plants—equivalent of 9 plants per 100 acres; 1959-60: 1,829 infected plants—equivalent of 6 plants per 100 acres; 1960-61: 1,475 infected plants—equivalent of 5 plants per 100 acres.

Banana Beetle Borer Control.—This pest in the northern banana areas has almost been wiped out by present control methods. However, outbreaks of borer were discovered in the previously clean areas of Coff's Harbour and Nambucca during the year, and action has been taken to assess promptly the extent of the infestation. Action to contain the outbreak to existing areas and completely eradicate it have been programmed.

Plant Diseases Act and Irrigation Act as affecting the M.I.A.—These were constantly policed in the M.I.A. by means of road blocks, shop and hawker inspections, and constant inspections at prescribed places of entry. These functions are difficult to implement, but there will be some relief when quarantine requirements at present under the Irrigation Act are transferred to the Plant Diseases Act.

To facilitate the funtions of the Euston Road Block and provide authority to intercept fruit at that point, steps were taken to proclaim as a quarantine area under the Plant Diseases Act an appropriate area surrounding the road block.

Prosecutions and Warnings.—Ninety prosecutions were instituted for breaches of regulations under the Plant Diseases Act; and 390 letters of warning were issued in respect of first offences. There was no prosecution under the Potato Growers Licensing Act.

Amendments to Proclamations and Regulations.—Regulation 30 (beetle borer control) was amended to provide for treatment of all plants in an infected plantation, instead of infested plants only, as in the old regulation.

Regulations 21 to 25 (citrus grading regulations) have been revised in collaboration with the New South Wales Citrus Council, for gazettal.

Regulation 20 (potato grading regulations) is under review in collaboration with the Potato Growers Association.

Extension Activities in Horticultural Industries

Extension services of the Division have been under heavy demand in all districts. Each of the principal fruit growing areas is now well equipped with facilities for extension purposes by means of radio, press, meetings, films and field days, and officers have fully exploited the aids. Matters that received special attention were:—

Black Spot Warning Service—Pome Fruits.—This service inaugurated in the Batlow and Orange districts three years ago, has proved to be a most valuable disease control guide to growers.

Local Spray Calendars.—A valued service in several districts was a local spray calendar issue for pest and disease control, supplemented by circular letters at timely intervals.

Control of Vine Disease "Dead Arm".—Control of the serious fungous disease of vines, Dead Arm, was excellent in the M.I.A., further to the extension campaign conducted in the 1960 winter. Work by the Department had shown that almost 100 per cent. control could be obtained by a single dormant spray of sodium arsenite.

Chemical Weed Control in Vineyards.—Because of recently displayed interest in chemical control of weeds in vineyards, Departmental research results were published in the *Agricultural Gazette of N.S.W.* during the year; information concerning appropriate weed-killers, rates and methods of application and precautions to avoid damage. In certain circumstances chemicals offer many advantages over conventional methods of weed control.

Citrus Maturity Testing Service.—Field officers have continued to supply a maturity testing service at the beginning of the Navel and Valencia crops. There were no consumer complaints this year regarding immature fruit, and this can be attributed to the efficiency of the service.

Reliable Fruit Tree Propagatory Material.—An important service to fruit tree nurserymen and the fruit industry generally continued to be given by the Department's Deciduous Fruit Tree Improvement Committee. Much of the deciduous fruit propagatory material used by nurserymen now comes from sources inspected and approved by this Department.

Bulk Handling of Fruit.—This new development in fruit handling at the grower end has gained considerable ground in both the pome and citrus industries. Field officers have played an important part by assisting growers in design and installation problems, and in development of ideas for improvements.

Farm Design for Irrigation.—Field officers in new irrigation areas have met many requests for irrigation design since the decision of the Water Conservation and Irrigation Commission to discontinue its service. Special knowledge and facilities are required for this work. It is apparent that if the Department is to engage permanently in this service it will have to organise accordingly.

Field Days.—Field Days have been held in all fruit districts, with attendances indicative of sustained fruitgrower interest.

An annual event for special mention is the Orange National Machinery Field Day, where a lot of time and effort is devoted to the orchard section.

Comparative Spraying Demonstrations.—The important section at the Orange Field Day and one which draws orchardists from all parts of the State, is the comparative spraying demonstration. The section is planned and supervised by the local District Fruit Officer, assisted by the Fruit Inspectors and three district fruit growers.

In this, the most comprehensive comparison of all types of spray units in Australia, participating equipment is subjected to efficiency tests in regard to dosage rates per acre and degree of spray penetration. In addition to these spray trials, all types of orchard machinery are subjected to comprative trials.

Demonsration Plots.—Plots established in principal fruit-growing areas continued to serve the useful purposes for which they were designed.

Fruit Packing Instruction.—Packing demonstrations were given in all of the major fruit areas by the Fruit Packing Instructor appointed under the Commonwealth Agricultural Extension Grant. This service was in keen demand, and there were many instances of adoption of improved methods. A great deal remains to be achieved in raising the grading and presentation standards throughout the State. The efforts of the Fruit Packing Instructor need to be supplemented by field officers and market inspections.

Publications.—Five new publications on horticultural subjects were printed and twenty-nine existing advisory leaflets were revised.

Research for the Horticultural Industries

SUMMARY

(1) Inclusion of diphenyl impregnated sheets in cases and cartons has considerably reduced mould wastage in oranges.

(2) The post-harvest application of a wax coating has reduced the development of black spot in stored Valencia oranges.

(3) A technique for post-harvest sterilisation of fruit fly affected citrus has been recommended.

(4) The Kara mandarin holds promise for coastal and inland districts.

(5) The Lambert Nucellar Eureka lemon has given promising results.

(6) Fibre-board cartons for bananas are under investigation.

(7) "Chloroxone" and P.C.P.A. sprays show promise as a means of overcoming the shape problem in William pears in the M.I.A.

(8) At least half the Packhams pear crop of New South Wales is now cool-stored with polythene case-liners as a result of investigations co-operative with the C.S.I.R.O.

(9) A fruit research officer is undergoing specialised training for viticultural research.

(10) Wine from experimental grape plantings at Molong has been highly praised.

(11) The sugar content of Doradillo wine grapes and the growth of vine are reduced by heavy crops.

(12) A number of chemicals gave satisfactory control of weeds in vineyards.

(13) A new strawberry, "Kendall", has been released from the breeding programme.

(14) Six varieties of canning peaches from the Department's programme of introduction and testing have been recommended for planting.

(15) New pruning systems have promise for canning peaches and prunes.

COMMITTEES AFFECTING RESEARCH

Co-ordination of Research in Fruit and Vegetable Processing.—This Committee comprises representatives of the C.S.I.R.O. Division of Food Preservation, this Department, and two representatives of industry. The Committee has aimed to co-ordinate research on fruit and vegetable processing in New South Wales, to review periodically the progress of current investigations, and to plan future work. Two meetings were held. Matters discussed included packaging of high moisture content prunes, and deterioration of canned apricots and pears.

Commonwealth Dried Fruits Processing Committee.—The aim is to co-ordinate dried fruit processing research. Members include representatives from the C.S.I.R.O., the Departments of Agriculture of Victoria, South Australia and New South Wales, and the Commonwealth Department of Primary Industry. Meetings are held annually. Since 1929, this Committee has actively encouraged research into all the major problems and disseminated information as it became available.

Deciduous Fruit Tree Improvement Committee.—This Committee, comprising officers of the Division of Horticulture and the Biology Branch, Division of Science Services, aims at measures to prevent spread of virus disease amongst deciduous fruit orchards and, in particular, to prevent propagation from infected areas. The Committee continued its survey of the distribution of virus diseases in the main fruit growing districts, and again successfully sought the co-operation of nurserymen in an inspection of all sources of propagating material for freedom from virus diseases. Two more commercial nurseries sought the help of the committee last year.

Co-ordination of Fruit and Vegetable Storage Research.—The 3rd Conference of Fruit and Vegetable Storage Investigators, held in Victoria at Sherbrook in November, 1960, was attended by three technical officers of this Division, together with representatives from all other States, New Zealand, the C.S.I.R.O. and the Commonwealth Department of Primary Industry.

Papers were presented by the Division's officers, on "Fungal wastage in citrus fruits after harvest; present position and future problems" and "Controlled atmosphere storage and film liners".

The Conference was followed by the biennial meeting of the Committee for Co-ordination of Fruit and Vegetable Storage Research. A co-ordinated programme of research on storage and transport was agreed to. A Murray Citrus Sub-committee was set up in respect to the handling, storage and marketing problems of citrus fruits from the Murray River areas; whilst a small, transport working party is concerned with the general problems that arise in interstate transport trials of fruit and vegetables.

Advisory Committee on Fruit Cool Storage Investigations in New South Wales.—The Committee comprises representatives from the C.S.I.R.O. Division of Food Preservation, Botany Department of the University of Sydney, and this Division. It met twice, and received reports of investigations on plant physiology and biochemistry aspects, fruit storage, citrus wastage, and chemical investigations.

Citrus Wastage Research Committee.—It is a sub-committee of the Advisory Committee on Fruit Cool Storage Investigations in New South Wales, and concerned with operation of the Citrus Wastage Research Laboratory at Gosford. The Committee met twice, to review current investigational work and to recommend future programmes.

Fruit Fly Sterilisation Investigations in Citrus.—Representatives of the State Departments of Agriculture in Victoria, South Australia and New South Wales, the C.S.I.R.O., and the Commonwealth Department of Primary Industry, constitute this Technical Committee. It met once during the year, and considered investigators' reports. As a result, the New Zealand authorities have been advised to accept an ethylene dibromide fumigation treatment. Investigators have shown that it sterilises fruit fly eggs or larvae in citrus fruits with a very high degree of security.

Citrus Improvement Committee.—This Committee, representative of this Division and Biology Branch of the Division of Science Services, met twice, to review and plan investigations of the effects and influences of virus infection, soil-borne root pathogens, and toxins, on citrus behaviour and productivity.

New South Wales Canning Fruits Advisory Committee.—Comprising representatives of canners and growers, with an officer of the Division of Horticulture as Chairman, this Committee was established by the canning fruits industry. It progressively reviews canning fruit plantings and makes recommenations to the industry. For some years the recommendation has been maintained at a level consistent with 20,000 tons of canning peaches from the Murrumbidgee Irrigation Areas.

Fruit Tree Nutrition Committee.—Representative of the Division of Horticulture and the Biology and Chemistry Branches of the Division of Science Services, the Committee met to survey current projects in the field of fruit tree nutrition.

RESEARCH LABORATORIES AND EXPERIMENT FARM ORCHARDS

Details of research projects at these institutions are given later, under the headings for respective fruit industries.

Progress of Tropical Fruit Research Station, Alstonville.—Good progress has been maintained. A block of 2,300 banana "bits" was planted to provide an area for short-term trials. All planting material was heat-treated for the control of the nematode *Radopholus similis.* Some 3,000 selected tops of the Smooth Leafed Cayenne pineapple were planted to provide mother plants for future trial plantings. The nursery was considerably expanded with sowings of pawpaw, mango, avocado, macadamia and custard apple. A fruit officer was appointed to assist in the research programme. The survey of winter temperature microclimes to determine the limits of safe planting was continued; so, too, was the hydraulic investigation of flow rates in Chilcott's Creek.

Griffith Viticultural Nursery; Rehabilitation as Research Station.—Underground tile drainage has been completed. The approximate £9,000 installation was required to rehabilitate the Station, adversely affected by high water tables. The Station is to be the centre for viticultural and tile drainage research in New South Wales. The first experimental plantings will be made in 1962.

Yanco Agricultural Research Station's Development.—A permanent overhead spray irrigation system has been installed, to serve eight acres of citrus rootstock trials planted in 1959. Because they possessed no special virtues, 300 trees in the citrus breeding block have been removed.

Irrigation has been developed for a new area of apples and stone fruits.

Investigations in hand concern peaches, apricots, prunes, citrus, apples and pears, with particular attention to:—variety improvement in peaches; stock and variety testing in citrus and apples; and irrigation, pruning, and nutrition of peaches, apricots and prunes. Other work there relates to the use of hormones for parthenocarpy in pears, and tree propagation methods.

Wagga Agricultural College Orchard.—Reconstruction of this orchard to improve its value for student instruction has continued.

Hawkesbury Agricultural College Orchard.—Similarly, reconstruction of this orchard has continued.

Citrus Wastage Research Laboratory, Gosford.—This is operated jointly with the C.S.I.R.O. Division of Food Preservation. The wastage trials include an investigation into possible elimination of the expensive, individual fruit wrapping for mould control under long storage conditions.

Projects on the control of mould in de-greening chambers, and the post-harvest control of citrus black spot development, are subjects of later paragraphs.

A major investigation at the Laboratory has been the sterilisation of fruit fly in oranges by post-harvest fumigation. This work, directed by the Technical Committee on Fruit Fly Sterilisation in Citrus may end a year hence.

Lower Murray Research Station Developments.—Eight more acres of citrus were planted, bringing the total to 29 acres. Permanent sprinkler irrigation is being installed on three acres for citrus; and a second 100,000 gallons underground storage tank is under construction. Investigations in hand concern:—citrus stock and variety testing; double planting; stem pit of grapefruit; citrus propagation methods; and strawberry and stone fruit varieties.

Citrus Experiment Station, Narara.—Overhead spray irrigation has been installed on 21½ acres of the Somersby section. The old lemon block at the Narara section has been removed, and the land prepared for a lemon replanting trial involving eight stocks. Current investigations comprise citrus stock and variety testing, on a very comprehensive scale.

Bathurst Experiment Farm Orchard.—A mist propagating unit was installed, primarily to investigate techniques in nursery practice. Much of this orchard relates to root-stock trials, some of them more than 30 years old. Other work relates to alternate cropping, thinning, spray residue removal, pollination of cherries and plums, and propagation. Three acres have been prepared for an extensive peach variety trial.

New England Agricultural Research Station Orchard.—Following a soil regeneration period, replanting to a new series of trials has commenced. The first is an apple stock and variety trial, including a range of the new Merton-Malling rootstocks.

Cool Storage Laboratories, Ryde.—Two officers of the Division of Horticulture are located at the C.S.I.R.O. Division of Food Preservation Laboratories, Ryde, formerly at Homebush. Co-operative investigations of cool storage problems are in hand, particularly in relation to apples and pears.

RESEARCH ON A FRUIT INDUSTRY BASIS

Research—Citrus Industry

Citrus Mould Wastage Control.—Inclusion of diphenyl-impregnated sheets in packed cases and cartons has reduced mould wastage in Navels and Valencias. Further work will assess whether the degree of control is sufficient for the "pads" to be an alternative to the relatively expensive individual wrapping of each fruit in diphenyl-impregnated wraps.

Post-harvest Control of Citrus Black Spot Development.—For the second season, application of a wax coating to Valencia oranges after harvest reduced the in-storage development of black spot. It had been thought that the effect was due to less moisture loss from the fruit; but a coating of a non-ionic detergent, whilst reducing black spot development, has increased weight loss in treated fruits.

Mould Control in Citrus De-greening Chambers.—The method devised for using ammonia gas in ethylene de-greening chambers to reduce mould wastage has been shown not to cause rind damage to injury-susceptible early season Washington Navel oranges.

Fruit Fly—Sterilisation of Citrus.—A submission has been prepared for the Technical Committee on Fruit Fly Sterilisation Investigations in Citrus, concerning a recommended fumigation treatment for sterilising fruit fly eggs and larvae in citrus fruit. Investigational work this year has shown that—

(1) the fumigant (ethylene dibromide) must be held in the fruit for many hours to achieve fly sterilisation;

(2) the level of ethylene dibromide in the fruit falls more rapidly where the fruit is held at higher temperatures;

(3) seven days after fumigation, the residue of ethylene dibromide in the fruit is below the maximum permitted by the United States health authorities;

(4) the recommended fumigation technique does not cause significant rind injury to coastal fruit.

Valencia Orange, Double Planting Trial.—This was planted at the Lower Murray Research Station in August, 1960. The eight acre trial is designed to provide information on the advantages and disadvantages of double-planting Valencia orange trees, with special reference to the effects of thinning the trees to normal planting distances at various times. The permanent trees are on Sweet Orange rootstock, whilst Trifoliata and Sweet Orange are being compared as the interplant rootstocks.

Controlling Citrus Tree Size.—Trials at the Citrus Experiment Station, Narara, show that trees on trifoliata rootstock can be reduced in size—by inoculation in nursery rows with selected "stunting" buds. Inoculation of stunting buds into older trees has now been done at the Griffith Viticultural Nursery, to study the effects on subsequent tree development.

Small Fruit in Citrus.—The problem of small fruit is under investigation at the Citrus Experiment Station, Narara; Yanco Agricultural Research Station; and on private properties at Dural and Griffith. Initially, the question of whether a virus disease is associated with the problem is being examined.

Kara Mandarin Trials.—The trials, coastal and inland, suggest that Kara mandarin could extend the mandarin season. Kara mandarin, bred at the University of California, matures quite late. Its juice and flavour are at optimum level about November.

Lambert Nucellar Eureka Lemon.—Nucellar Eureka lemon selections are being compared at the Citrus Experiment Station, Narara. Of these, the Lambert selection has deserved more extensive tests. In combination with a number of rootstocks. Lambert Nucellar Eureka lemon has been planted at Griffith in new land, and as replants in old lemon ground on Griffith and Kenthurst properties.

Trifoliata Rootstock and Waterlogging.—A series of tests has been completed in which various selections of trifoliata seedlings were in completely waterlogged soil for periods of up to three months. No seedling died, but growth was generally suppressed and some defoliation occurred under the more severe treatments. The trials have not explained the rapid death of trees on *P. trifoliata* following flooding of orchards at Windsor.

Research—Tropical Fruit Industry

Bananas—Cercospora Leaf Spot, and Speckle Control.—Test treatments included low volume mists of oil, oil plus Zineb, and low volume water mists plus a fungicide. Oil mists continued their good control of leaf spot, without damage or loss of production. Inclusion of a fungicide to control speckle is necessary. Low volume water sprays plus a fungicide are giving good control of leaf spot and speckle.

Bananas—Packing Trials.—The suitability of different shapes of bushel cases for bananas was investigated. A trial of the suitability of cardboard cartons packed with banana hands was initiated. This will be co-operative with the C.S.I.R.O., the Department of Agriculture and Stock, Queensland, and industry.

Bananas—Fruit Fly Sterilisation.—Banana fruits were successfully treated with Rogor 40 and Lebaycid to kill fruit fly eggs and larvae.

Banana Leaf-fall.—A project to investigate the value of a number of trace elements in the control of leaf-fall was established at Mooball. The influence of soil sterilisation is also under investigation.

Pineapples—Type of Planting Material.—This trial at the Tropical Fruit Research Station, Alstonville, involves six types of planting material. Fruiting has commenced and the first round of results should be available next year.

Papaw Line Breeding.—A line breeding programme was established at the Tropical Fruit Research Station, and 60 trees from the second generation female seed were planted out.

Research for Control of Fusarium Wilt Disease in Passionfruit.—A description of the *Fusarium* wilt disease of passionfruit and a method of grafting the *Fusarium*-susceptible common purple passionfruit (*Passiflora edulis*) on to a resistant rootstock have been prepared for publication in the *Agricultural Gazette of N.S.W.*

Two strains of *P. edulis* f. *flavicarpa* (yellow passionfruit) are being compared in the glasshouse at the Citrus Experiment Station, Narara, for degree of resistance to *Fusarium.*

Hybrid seed of *P. edulis* x *P. edulis* f. *flavicarpa* was obtained from the Queensland Department of Agriculture and Stock. Selection from the resulting seedlings was made on such criteria as *Fusarium* resistance, yield, crop quality, winter hardiness and similarity to *P. edulis.* Further breeding from the selection will be made. This work is being carried out in co-operation with the Biology Branch, Division of Science Services.

Research—Pome Fruit Industry

Variety Collections and Testing.—Variety collections of apples, pears and quinces have been maintained and added to as necessary.

Apple Rootstock Trials.—Progress in the apple rootstock trial planted in 1959 at Yanco Agricultural Research Station to test 16 rootstocks for the Granny Smith variety has been satisfactory. A similar trial for Jonathan, Delicious and Granny Smith has been commenced at the New England Agricultural Research Station.

Twist of Gravenstein Apple.—A propagation technique has been evolved that considerably reduces the degree of twist.

Alternate Cropping of Apples.—This trial investigates the effects of chemical thinning and nitrogen application, alone and in combination, on the alternate-bearing habits of Delicious. Thinning appeared much more effective than nitrogen.

Pyrus calleryana, D6 Seed-Cleaning Trials.—Because of difficulty of getting clean seed of *P. calleryana,* trials were initiated to find a simple and effective means of obtaining clean seed. A fermentation process of up to six weeks has proved satisfactory, and germination tests proved that it did not affect seed viability.

Bumpiness of Williams Pears.—The shape of Williams pears in the M.I.A. is improved by parthenocarpy. Several hormones were tested at Yanco Agricultural Research Station to determine their influence on fruit set and shape. "Chloroxone" and P.C.P.A. each gave encouraging results.

Control of Superficial Scald.—Co-operative trials with the C.S.I.R.O. Division of Food Preservation have demonstrated good control with the use of diphenylamine. "Ethoxyquin" was effective also.

Polythene Case Liners for Pears.—Improved quality and longer storage life for pears in cool storage resulted from the use of polythene case liners in co-operative trials with the C.S.I.R.O. Division of Food Preservation. At least half the total Packham pear crop in New South Wales is now being stored in this way.

Research—Viticulture

Training Research Officer in Oenology.—A Fruit Research Officer stationed at Griffith Viticultural Nursery, has been granted thirteen months' leave to undertake the Oenology Diploma Course at Roseworthy Agricultural College, South Australia. The training in wine-making and viticulture, embodied in the course, will be a valuable asset in conducting research into wine and table grape production in the M.I.A.

Trial of Wine Grapes at Molong Favourable.—The final lot of experimental wine was made from the plot in 1960 and is still ageing in casks. The grapes were somewhat overmature when processed, resulting in a fruity wine with a high tannin content.

The 1959 vintage wine, bottled in early 1960, is well balanced and possesses a good bouquet.

The 1957 vintage wine, in its first two years a wine of excellent quality and highly appraised by prominent tasters, has become slightly acetic. This is a fault in manufacture. It is not the fault of the grapes themselves.

Difficulties in making small quantities of wine and in transporting the grapes a long distance before processing, have affected this experiment. Even so, it would appear that Molong district is suitable for production of quality dry red table wines. A characteristic of the wines is their high colour and soft tannin.

Rootstock Trials for Table Grapes.—Identical trials at Orchard Hills and at Chipping Norton were planted in 1958 and 1959 respectively, to test eight different *Phylloxera*-resistant rootstocks for Black Muscat table grapes. At Orchard Hills the vines on 62.66, 106.8 and own roots were the most vigorous. Vines on 420A, Montpellier and Metallic Cape were difficult to establish, while some vines on 3309 showed symptoms of leaf-roll virus.

Gibberellic Acid on Wine Grapes.—Various strengths and times of application of Gibberellic Acid, to loosen the bunches of Frontignan wine grapes, were tested at Griffith. The trial area was severely damaged by hail but early indications were that Gibberellic Acid was less effective on Frontignan than on Hunter River Riesling, on which the trials were conducted in the 1959-60 season.

Fertilizer Trials—Hunter Valley.—Heavy and deep applications of potash and superphosphate were tried on Black Shiraz wine grapes in the Hunter Valley; as high as 6 lb. of potash and 1 lb. of superphosphate per vine. No response was observed—in appearance, yield, sugar content, potash and phosphate content of leaves, or in growth as measured by the weight of prunings.

Darodillo Decline.—The influence of cropping levels on Doradillo decline is now under investigation at Griffith. Vines were cropped at five different levels. Yield and growth data were collected. The results have strongly indicated that sugar content of the grapes and growth as measured by weight of prunings, are inversely proportional to crop size.

Nematode-resistant Grape Rootstocks.—Trials of resistance of the main *phylloxera*-resistant rootstock varieties to nematodes were established at Griffith and in the Hunter Valley. Cuttings of recently imported nematode-resistant stocks from U.S.A., namely Solonis x Othello 1613 and Salt Creek are being propogated at Griffith Viticultural Nursery.

Improving the Strike of Cuttings.—Treatment of *phylloxera*-resistant cuttings with indole butyric acid at 2,500 p.p.m. improved the strike and growth of the rootlings, provided the cuttings were not stratified.

Chemical Weed Control in Vineyards.—In co-operation with Division of Plant Industry, a range of weed-killers was tested in the M.I.A. Of the chemicals used, Monuron again proved the best, and Simazin, Atrazine and Diuron were quite effective. No damage was observed.

Control of O'hanez Bud Mites.—A co-operative experiment with the Entomology Branch, Division of Science Services, on the control of O'hanez bud mites has shown that sprays of Parathion, Phosdrin and Tedion, applied in November, appreciably increase yield (in the following seasons) of O'hanez table grapes in the M.I.A. This effect is obtained by killing bud mites which infest O'hanez buds at an early stage of development and damage the bunch primordia.

Phylloxera-resistant Rootstock Sales.—Sales of *phylloxera*-resistant grape rootstocks for the 1960 planting season amounted to 38,040; compared with 43,595 and 21,915 in 1959 and 1958 respectively. Sufficient rootlings were propagated to satisfy the demand for all but one of the four main varieties. Orders for the 1961 planting season amounted to 55,205. Mother vine plantings that remained at Griffith Viticultural Nursery have now been removed. Future propogation of all grape rootstocks will be at the Citrus Experiment Station, Narara; although the new mother vine block at Yanco Agricultural Research Station will be the major source of cuttings.

Research—Stone Fruit Industries

Dessert Stone Fruit Variety Trials.—Further introductions were made from interstate. Varieties introduced from overseas were in post-entry quarantine and being screened for virus diseases.

Several promising locally raised and introduced varieties of peaches, apricots and plums were included in district trial plots. Established trials of new varieties were maintained on Research Stations and private orchards in all the main producing districts. New stone fruit variety trials were established at Bathurst and on the coast.

Canning Peach Variety Trials.—A trial established in 1948 at Yanco Agricultural Research Station to test 16 varieties was completed. The results are being collated in preparation for publication. Six varieties were recommended for commercial planting.

A new trial, established in 1958 with fourteen varieties, was designed to replace the foregoing trial—on a better soil type. Some are expected to crop next season. A further trial of four recently-introduced South African varieties was planted.

Pruning and Thinning Trial with Golden Queen Peaches.—Trials at Leeton and at Yanco Agricultural Research Station to compare with the orthodox system the newer pruning methods, of long lateral and "hanger", appear to favour the newer techniques. No benefit has so far been gained by thinning; the trees appear fully capable of carrying the total crop set.

Stone Fruit Breeding.—A number of introductions, and selected seedlings from the Division's breeding programme, show promise. They are at various stages of assessment. This work is at present confined mainly to peaches and apricots, for canning and dessert purposes.

Prune and Pruning Trials, Irrigation Conditions.—Eight years investigations at Yanco Agricultural Research Station have shown that a biennial pruning treatment has given higher yields than annual pruning, by 2.4 tons per acre.

Internal Breakdown of Apricots.—Nitrogen treatments again caused a sharp rise in internal breakdown, compared with no nitrogen plots. It was possible to correlate rises and falls of breakdown levels with preceding temperatures. The only exception to this was the harvest wilt plots. These increased in breakdown from commencement to end of harvest. Of the irrigation treatments, this one had the most influence by generally increasing the internal breakdown level.

Cherry Canker Investigations.—Numerous trial plantings of cherries to test varieties and rootstocks have been made during the past two years in all the main producing areas. One of the most important trials, located at Orange, has been designed to determine the effect of working bacterial canker susceptible varieties of cherries high on two resistant stocks, compared with the normal low working, in terms of canker damage, tree growth and fruit yield. Trees in this trial are now one year old and have made very satisfactory progress.

Peach, Plum, Prune and Apricot Stock Trials.—A range of material to be tested as rootstocks for peaches was collected and propagated. It includes five varieties of European plum, two varieties of red leaf peach, and two varieties of nematode-resistant peach.

The Buck plum stock (PH5) developed by the Department continues to show superiority over all other rootstocks for European plums and D'Agen prunes.

Early results from an apricot stock trial planted three years ago in the M.I.A. indicate that Buck plum may also prove a very good stock for these trees.

Propagation of Buck Plum from Cuttings.—Progress has been made with methods of improving the "strike" of Buck plum cuttings. Planting direct into the nursery now has given much better results than has stratification of cuttings and spring planting. Subjecting the cuttings to a period of chilling after they "take" also gave significant improvement.

Research—Strawberries

Variety Improvement.—The new strawberry variety "Kendall" was distributed to eighteen selected growers for testing and plant multiplication. Kendall, produced by the Department's plant breeding programme, has given early heavy crops and is resistant to leaf spot. The berry is of good shape, colour and size right through the season.

Research—Miscellaneous

Tile Drainage.—These investigations are centred at the Griffith Viticultural Nursery where an area of 14 acres has been prepared for intensive investigation of tree response to tile drainage depth and spacing.

Surveys of district tile drain installations have been undertaken over a number of years. There is now evidence that tree response varies with distance from the drains, particularly where drain spacing is sub-optimal.

M.I.A. Planting Tends.—A continuing survey of trends in the M.I.A. planting statistics is maintained, particularly in relation to canning fruits. The work was extended during the year by a special survey of wine grape statistics.

Fruit Industry Trends

TROPICAL FRUIT TRENDS

Production.—Production of bananas again exceeded three million cases, but due to weather the spread throughout the year was more even than usual. Heavy glut periods were not experienced. Prices, though never very high, were never very low, and banana growers were probably better off for having marketed a huge crop at average prices. Total production was 3,088,601 cases, or 4,118,134 bushels.

Banana Statistics.—Statistics for New South Wales bananas at 30th March, 1961, were:—

	acres
Total acreage	28,936
Area planted, 1960-61	1,415
Area destroyed	2,330
Decrease	915
Number of growers	4,335

Total acreage of bananas and number of growers have decreased. The first significant reduction of acreage for many years has probably been a reaction to the lower returns over the last few years. Planting of 1,415 acres continues the trend of keeping plantations young and vigorous.

The Williams variety still increases in favour; with 23,973 acres under this variety—83 per cent. of the total area. The remainder is almost all Cavendish. Williams is replacing Cavendish. It suits the climate better and produces better grades of fruit.

Cultural.—Cultural methods continued to improve; one of the main factors causing higher production. Banana growers make increasing use of irrigation, fertilizers, mechanical transport, mechanical clearing, plastic covers and misting.

Marketing.—The banana industry has increased its interest in all forms of marketing. Cardboard cartons, bushel cases, waxing the fruit, processed bananas, and banana ice cream have all received some attention.

CITRUS INDUSTRY TRENDS

Light Production.—Light crops were typical in all citrus districts. Prices were high, and harvesting ended earlier than usual. In the absence of mature fruit in the autumn, red scale control was of a high order.

Markets.—Aided by the light crop, prices have been generally on the high side. This continued with new season fruit, and satisfactory prices were received for Navel oranges up to 30th June, 1961. Marketing was assisted by the close supervision of maturity standards.

Imports.—Encouraged by high prices associated with an abnormally light crop, and the lifting of quarantine restrictions in respect of citrus canker, 2,000 cartons of citrus were imported from California in the autumn of 1961. Generally, external quality was attractive, but internal quality was less so. Shrinkage was apparent in oranges where the "rapid pack" method had been used. Importers expressed some dissatisfaction.

Processing.—Processing to improve the appearance and increase the shelf life of the fruit is becoming widely accepted by the industry, and more plants have been installed by packing houses and individuals. The process includes washing, sterilising against mould, rinsing, waxing and drying.

Bulk Handling.—Bulk handling, chiefly in the "orchard to packing house" phase, has become popular. It is displacing the lug boxes previously used. The aim is reduced handling costs.

Modern Spray Applications.—Mechanical application of sprays by means of high speed air streams or by booms has increased in popularity in all districts. The modern equipment allows better timing and more effective use of favourable weather, while reducing labour cost.

Fixed overhead spray irrigation continues to find favour, for its efficiency on undulating land and its low labour requirement.

Juice Extraction.—Increased interest has been shown in the M.I.A. where a modern juice extraction and processing plant has been established at the Leeton Co-operative Cannery.

Frozen juice concentrate is also receiving attention. A Melbourne firm is buying oranges in New South Wales for the purpose.

Supplementary Irrigation.—This has maintained its important position in high rainfall districts, but shortage of funds has reduced the rate of installation.

POME FRUIT INDUSTRY TRENDS

Production.—The New South Wales apple crop was estimated at between 2.2 and 2.3 million cases, just a little below last year's total crop. It should normally have been an "off" or light crop year, so the result has been very satisfactory. It continued the trend of the past six or seven years. In this period there has been a notable absence of the alternating light crop, formerly a feature of New South Wales apple growing. In addition the New South Wales crop potential has increased very substantially in the past ten years or so. It is now at least 75 per cent. greater than in the early 1950's, and will continue to increase for some time yet.

A run of generally favourable seasons, better disease and pest control by the newer spray materials, spray materials' less adverse effect on general health and well-being of the trees than was formerly so, lighter pruning, better fertilizing, improved rootstocks, crop thinnning measures, and, not least, the concentration of new plantings in localities more favoured by climate and soil, have all influenced the trend.

Over 90 per cent. of the young non-bearing trees in New South Wales are in the six districts best suited by reason of soil and climate for production of apples. Many lesser favoured areas are going out and several have ceased to be of any consequence in pome fruit production.

Bulk-handling the Pome Fruit Crop

Bulk-handling in the orchard and through the cool store has taken on and is progressing steadily. Comprehensively illustrated articles on the range of equipment and procedures have been prepared for publication in August/September, 1961, issues of the *Agricultural Gazette of N.S.W.*

The 475,000 case pear crop was possibly better than that of the previous year and of good quality.

Pear growing is almost confined to the highland districts—Batlow, Orange and New England, and the M.I.A. New plantings have been only at maintenance level for some years. Hence, there should be no great increase in production, except perhaps in the M.I.A. There, substantial plantings of the W.B.C. variety were made after the heavy losses of stone fruit in 1956.

Most new plantings in the past decade are on *Pyrus calleryana* rootstocks. This will have some influence on crops in the future, because it has shown such superiority over former rootstocks as regards growth of tree and cropping.

Cool Storage.—Growth of fruit cool storage facilities in New South Wales has been phenomenal in recent years; mainly in private grower stores. A few years ago total New South Wales storage space for fruit provided for less than 800,000 cases, including the large Sydney stores. Today it totals 1,400,000; most of it at the fruit growing centres, principally Orange and Batlow.

The effect of available storage for over half the total crop is seen in the absence of glut periods in the markets, and in the evening-out of the price range over the twelve months.

New Plantings.—At present there are some 3,000 acres of apples and 390 acres of pears classed as non-bearing; mainly in the more favoured districts, and likely to cause a marked New South Wales crop increase within a few years.

Most of these young trees and many thousands now in the early bearing stage are on strong growing seedling stocks, and will eventually carry large crops. However, because of the costs of cultural attention for large trees, and also the long pre-cropping period associated with use of seedling stocks, growers are now reverting to Northern Spy stocks—to cut costs of production. This is a logical also because in the better areas, where most plantings will occur, Northern Spy rootstocks will produce trees adequate for any purpose.

Another trend is the growing interest in close planting, on the hedgerow system. In suitable areas this, too, is logical, as properly managed production per acre can be stepped up very appreciably and the hedgerow is ideal for spraying under any air-blast system.

Variety Trends.—At present, very few varieties are being grown commercially. Plantings are 75.7 per cent. Granny Smith, Jonathan and Delicious, and the bulk of the remainder are early varieties.

A marked tendency has been to plant less Granny Smith and more of the red varieties, but Granny Smith is still by far the most popular and comprises well over 40 per cent. of total plantings. With almost 100,000 as yet non-bearing trees of Granny Smith, this will hold its premier position for many years.

Increasing interest in the highly-coloured "sports" is noted, and indicative of this trend there have been many more Red Jonathans and Red Rome Beauty planted in recent years in preference to the standard Jonathan and Romes.

There is interest also in the new colour "sports" of the Delicious recently imported from the U.S.A. In several districts preparations are being made to plant blocks of these as soon as sufficient trees are available. The McIntosh Red, for many years a mainstay in the Oakdale-Lakesland area, would appear to be on the down grade due to Red Jonathan competition from Stanthorpe, Queensland. The usual high prices for Gravensteins may also recede due to this same competition, and the fact that they have been heavily planted in our own coastal districts.

The pear position is static. Little is being planted except W.B.C. and Packhams. No worthwhile new variety is in prospect.

Bulk Handling.—Development in this direction is proceeding gradually. The main activity is centred at Orange. There, a dozen or so growers have installed bulk-handling facilities. Though not a big percentage of the district growers, they are handling a very significant proportion of the district crop. All are most satisfied with the systems installed, and it is anticipated that soon many more growers will change to this system.

Bulk-handling installations are also in satisfactory operation at Batlow, Oakdale, Lakesland and New England.

A further trend is shipment in bulk from Tasmania. Two trial consignments, using a specially-constructed steel bin holding 44 bushels, have shown it as a practical move. The fruit in each instance has arrived in better condition than the "controls" in wooden cases. When facilities for handling the bins are arranged satisfactorily at this end, there will be considerable expansion in this method of shipment.

Fibreboard Cases.—Fibreboard cases, particularly the traypack type, has become a feature of the marketing system and are increasing. Agent's initial prejudice against this type of case is breaking down, and some agents are canvassing clients to forward all fruit in traypacks.

Export.—The Granny Smith crop in the M.I.A. was the lightest for years. Most other districts suffered from hail damage. So, only small quantities of apples were shipped from New South Wales during the past season. The usual early shipment of Granny Smiths from New South Wales and Queensland was this season mainly Stanthorpe fruit, with little over 4,000 cases from New South Wales. In spite of the usual immaturity, the consignment again brought good prices—45s. to 50s. per case.

STONE FRUIT INDUSTRY TRENDS

Production.—Seasonal conditions varied between districts and overall were not favourable. Spring conditions adversely affected the canning peach crop in the M.I.A., plums in many districts, and cherries at Orange. Late summer and autumn were ideal for all crops. Whilst yields of canning peaches, cherries and plums were well below average, dessert peach crops were much better than usual. The prune crop was probably a record one. Fruit sizes were generally very good for all fruits, but quality for canning production was deficient.

Apricot Production for Canning.—Fears of over-production have receded, because of the development of an apricot concentrate.

Canning Peach Plantings.—An upward trend in production will be apparent in the near future, as large numbers of young trees begin producing.

Prune Acreages.—Very few new plantings are being made, either in the Young district or the M.I.A. Much-improved production has been achieved in the Young district, a result of better management and favourable seasons. Most trees at Young are 30 to 40 years old, with few young trees to help boost yields.

Plantings of prunes in the M.I.A. in recent years have been heavy, and now most of the producing trees are in the younger group. A steady rise in production and improved quality are expected.

Prune Marketing Methods.—There has been a greatly-increased trend towards marketing prunes as a high moisture pack in plastic film containers. As a result, consumer demand has improved. There is a strong feeling that much greater demand could be stimulated by a vigorous advertising campaign.

Cherry Planting.—Spectacular expansion is taking place in the Young district. Again last year about 170 acres were planted there. This increase would have been doubled if sufficient trees were available.

New South Wales production is not expected to increase greatly in the near future, because of decline of old trees in the major-producing area at Orange and few young trees established in any district other than Young.

Dessert Peach Acreage.—Plantings in most districts continued to expand, though numbers do not exceed those required to maintain the existing bearing area. Main expansion is on the coast and at Bathurst.

Fibreboard Cases.—There has been increased interest in the Bathurst district, in the use of fibreboard tray-pack containers for peaches. Several growers have tried them and been highly satisfied.

General.—Further releases of land for residential purposes have resulted in the destruction of about 100 acres of highly-productive stone fruit plantings.

New Areas.—There is a growing interest in stone fruits in areas along the Murray River and on the north coast. Early-maturing varieties are most favoured in these areas. Departmental demonstration plots, though few and only recently established there, are supplying useful information on the performance of varieties under such conditions.

WINE AND GRAPE INDUSTRY TRENDS

Production.—About 24,468 tons of wine grapes were produced, compared with 20,690 tons in 1959-60. The M.I.A. produced 21,668 tons, compared with 18,408 tons in 1959-60. Vintage conditions were ideal, particularly in the M.I.A. In the Hunter Valley a heavy infestation of vine mites reduced yields, particularly on the white-wine varieties.

In addition to local production, 5,892 tons produced in the mid-Murray irrigation district of Victoria were processed by M.I.A. wineries, compared with 1,601 tons in 1959-60.

Wine production in New South Wales for the 1960 vintage was 3,840,102 gallons, and it is estimated that 5,009,000 gallons were produced this year.

Grape Prices.—Wine grape prices in the M.I.A. were again increased, for most varieties by £2 per ton over those operating in the previous season. However, demand for grapes was exceptionally keen and most wineries paid a bonus of up to £3 per ton, so the overall increase was £5 per ton. Returns to growers were the highest since the 1952 vintage.

Grape Plantings.—Wine grape plantings in the M.I.A. during the current winter may exceed those in 1960, the highest for many years. Winery capacity and current demands for wines are more than adequate to cope with the increased production of the new plantings.

Diversion of Drying Varieties.—A marked trend in the industry is the increase in the quantity of drying varieties that are being diverted to the wineries. In 1961, 5,892 tons of sultana and Gordo Blanco from the Murray River dried fruits districts were processed in the M.I.A., compared with 2,601 and 2,728 tons in 1960 and 1959 respectively. The sultanas are being used for distillation wine, and the Gordo Blanco is in strong demand for "cream" sherry-type wines.

Improved Production Methods.—Improvements to wineries and equipment continued. Several wineries have installed elaborate and expensive plant, largely to improve table-wine quality. Demand for them has risen sharply in recent years. Results from the better production methods are more than compensating for the outlay.

TABLE GRAPE INDUSTRY TRENDS

Production.—State production of table grapes in 1960-61 is estimated at 5,200 tons, compared with 4,531 tons in 1959-60. A generally favourable growing season, and greater diversion of drying varieties because of the good prices, were responsible for the increase. The M.I.A. produced 223,487½ bushel cases, compared with 144,482 in 1959-60.

Quality was good, although rapid drying of bunch stems was prevalent—indicating the need to cool fruit prior to marketing.

Packing.—Considerable fruit was received on the Sydney markets packed in fibreboard half bushel cases. It appears to be a successful pack. An increasing quantity of table grapes is loose-packed in cases made larger by the use of cleats on the end or use of corner-pieces. Out-turn of fruit in the loose packs is excellent, as berry damage is reduced considerably. Buyers and agents are enthusiastic about the loose packs.

Diversion of Drying Varieties.—Diversion of drying varieties, principally sultanas, to the fresh fruit trade, continued to increase. The trend has been even more pronounced in Victoria. Berry shedding and small berry size of the sultanas are disadvantages, but it gained popularity through being early and seedless.

Table Grape Immaturity.—Large quantities of immature table grapes have continued to be marketed, particularly sultanas. The depressing effect on prices is apparent.

DRYING GRAPE INDUSTRY TRENDS

Production.—New South Wales production of dried vine fruits in 1960-61 has been estimated as 10,000 tons, compared with 8,046 tons in 1959-60. An above-average vine fruitfulness, associated with a favourable growing and drying season, has caused the increase.

The currant crop was particularly good, in contrast to the poor crop of the previous year. No trouble was encountered in sun-drying 85 per cent. of the sultana crop. The remainder had to be dehydrated. About 60 per cent. of the lexias required dehydration. Quality of the dried fruits has been generally high.

Diversion to Wineries.—Diversion of fruit of drying varieties to the wineries has increased, particularly in the mid-Murray area where over 25 per cent .of the total crop was processed for wine. If the trend continues, as is likely, it will close some of the dried fruit packing sheds.

Decline of Plantings in Mid-Murray.—Dried vine fruit plantings in the mid-Murray area are slowly declining. Weather conditions during the growing and drying seasons are less favourable there than in the lower Murray districts. Drying varieties are being replaced by trees, or by table or wine grapes.

Markets.—Increasing competition from other countries is now affecting sales of Australian dried fruits, of which 75 per cent is exported. World production is increasing. This, and the possibility of a loss or reduction of market in Great Britain, makes a doubtful outlook. Despite increasing population, domestic consumption has not increased.

DIVISION OF DAIRYING

Activities of the Division comprised the administration of Acts (mainly the Dairy Industry Act) and Regulations, herd production improvement activities, extension and research affecting the efficiency of the dairying industry, and maintenance of the standard of dairy products.

Unfavourable seasonal conditions in the north coast dairying districts were reflected by a sharp fall in butter production in particular. Elsewhere conditions were more favourable, especially on the far south coast and in the Milk Board areas.

Butter production fell by 18 per cent. and milk by 7 per cent., whilst cheese increased by 22 per cent., compared with the previous year.

Production for 1960-61 in comparison with the previous 12 months is shown hereunder:—

	1959-60	1960-61
Milk	*350,000,000 gal.	*327,140,000 gal.
Butter	92,677,582 lb.	76,153,293 lb.
Cheese	9,740,272 lb.	11,862,788 lb.

*Approximately

Legislation Amendments

Dairies Supervision.—The Local Government and Dairies Supervision (Amendment) Act, assented to on 24th November, 1960, conferred power on the Governor to make regulations prescribing requirements as to location, lay-out, design, construction and maintenance of dairy premises and milk stores; and as to provision and construction of facilities on or in dairy premises or milk stores—to secure the wholesomeness and freedom from contamination of milk or cream and the cleaning and sterilising of cans, vessels, utensils, appliances and equipment used in dairy premises or milk stores.

The Act also amended the Local Government Act by inserting a new Section 94A. This, in brief, empowered the Governor, in an area where the supervision of dairy premises and milk stores is not being carried out to the satisfaction of the Minister administering the Dairies Supervision Act, to require the local Council to appoint one or more servants to carry out the duties required of it by the Dairies Supervision Act.

The Department is now considering promulgation of additional and amended regulations under the Dairies Supervision Act, to implement the powers conferred by the amending Act.

Dairy Industry Act Amendment—Margarine Labelling.—Gazetted regulations provided for separate labellings of table and cooking margarine, and prescribed the size of lettering to be used on the labels. These Regulaitons were enforced as from 31st May, 1961.

They aim to ensure that table and cooking margarine are identified respectivly as such. In the past, cooking margarine in some cases has been sold merely as margarine, and the Regulations are especially aimed at correcting this situation.

Regulatory Services

DAIRY INDUSTRY ACT, 1915-60

Advisory Committee.—The Dairy Produce Factories Advisory Committee met twice, to consider new applicaitons for registration. Each application (two) was approved.

Appeal Board.—The Appeal Board constituted under Section 2 to deal with appeals against decisions of Inspectors under the Act, had no reason to meet.

Registration of Factories and Stores.—There were 109 Dairy Produce Factories and 76 Dairy Produce Stores registered under the Dairy Industry Act; as at 30th June, 1961.

Factory plant, buildings and machinery were kept at a satisfactory standard of construction and hygiene by the co-operation of factory managers, directors and dairy officers.

Factory Renovations and Extensions.—Developments in regard to dairy produce factories included the following:—

Extensions and renewals to the butter department of the Hunter Valley Dairy Society at Hexham. This butter section is being enlarged; re-equipped with modern stainless steel churns, and expanded storage.

The Berrima District Co-op. Society at Bowral is also providing a new butter manufacturing section and cold storage facilities.

For the Co-operative Dairy Society's factory at Raleigh, the plan provides for a butter manufacturing section. It entails removal of the buttermaking plant from Bellingen, and closing of that factory to combine its activities with Raleigh.

Extensions designed for the Gloucester Co-operative Dairy Society provide for powdered milk and at a later date cheese manufacture.

Kameruka Estate factory has installed a section for processing cheese after manufacture and packaging.

Extensions planned for Moruya Cheese Factory, mentioned in last year's report, are proceeding satisfactorily.

Dairy Science Schools, and Certificates of Competency for Dairy Factory Operatives.—Six Dairy Science Schools were held, for tuition and examination of ninety-seven candidates for qualifications under the Act. Also, many factories were visited by examining officers, to conduct examinations not covered by the schools.

Examinations	Certificates Issued
Cheese making	14
Butter making	22
Milk Grading	38
Milk Testing	42
Cream Testing	44
Cream Grading	41

The number of applicants for examinations indicated the sustained interest in the industry, in qualifying for the various certificates.

Where special classes were held by dairy officers the results justified them.

Butter Manufacture and Grading.—The Butter Grading staff regularly examined butter and cheese manufactured by New South Wales factories and received at Sydney, Newcastle, Wollongong and Goulburn for distribution and storage prior to sale on the local market. Samples from Goulburn and Wollongong were sent to Sydney for grading. Butter manufactured at Casino Co-op. Dairy Society was examined at that centre prior to cold storage.

Resultant information in each case was furnished to factory managers and District dairy officers. This was to help overcome any quality faults or other manufacturing defects noted at the grading examination.

Considerable quantities of butter were imported into New South Wales from other States during late autumn, winter and early spring to supplement local production. At the request of the selling agents, the quality of this butter was checked by the graders prior to distribution.

Quantity of Butter Examined and Graded.—The number of boxes of butter from interstate and intrastate sources examined by the State Graders was 1,298,976, compared with 1.467,869 in 1959-60, and 4,690 Grade Notes were issued.

Services through Shows and Competitions.—Specialist officers served as judges or stewards in the Dairy Produce Section of the R.A.S. Show, the North Coast A. & H. Society Show, Lismore, the Newcastle A. & H. Society Show, the Coff's Harbour A. & H. Society Show, and competitions in conjunction with the N.S.W. Division of the Australian Dairy Factory Managers and Secretaries' Institute.

Moisture and Salt Analyses Service.—Moisture and salt content of butter manufactured at New South Wales factories were analysed, and the results forwarded to District dairy officers.

Biological and Chemical Investigations.—Several special investigations of butter quality defects were made at various New South Wales factories. The Biology and Chemistry Branches, Division of Science Services, co-operated with the Division of Dairying in many of the cases.

Retail Butter Survey, Metropolitan.—In July, 1960, a retail butter survey was conducted in the Sydney metropolitan area. It fitted into a general survey by the C.S.I.R.O. to determine the quality of butter reaching the consumer throughout Australia.

Factory Supervision by District Officers.—In addition to the foregoing services, conducted by specialist officers in Sydney and at country centres, District dariy officers supervised the quality of milk and cream at site of manufacture into the various products.

This enabled close supervision of quality control, and maintained close liaison between farmer and factory and between factory and distributor. Its effectiveness is reflected in the "Order of Merit" Scheme conducted by the Department to stimulate interest in butter-quality uplift.

Milk and Cream Quality—Statistics of Factory and Farm Visits.—Officers spent 6,227 hours in dairy-produce factories check-grading milk and cream and in connection with the manufacture of other dairy products.

Two hundred and eighty-two visits were made in connection with check-grading milk and 674 for cream. As a result, 3,915 farms were visited to advise the respective farmer on how to overcome the defects apparent at the factory.

Seventy-five special investigations were made on farms for milk and cream defects, and 187 special investigations were made in dairy-product factories.

"Order of Merit" (Butter) Certificates Scheme.—To be eligible for consideration for an Order of Merit (Butter) Certificate of the N.S.W. Department of Agriculture, a factory must submit for grading during a season the following percentages of its butter that has been branded as "choicest" quality:—

	Per cent.
March-April	25
October-November-December	45
January-February	65
Seven months period (overall), comprising those specified above	65

The specified seven months, of the twelve from 1st March of one calendar year to 28th February of the next, are regarded as constituting a season.

To qualify, a factory must also market true to choicest brand at least 92 per cent. of its "choicest" branded butter—examined by Butter Graders of this Department and the Commonwealth Department of Primary Industry.

Twelve factories were awarded Order of Merit (Butter) Certificates.

Percentage of Choicest Butter.—The percentage of butter marketed as choicest quality was 89 per cent, compared to 90.8 per cent. in 1959-60.

The comparative figures for five years past are:—

Per cent.
1956-57—83 — 2 merit certificates issued.
1957-58—86.8— 4 merit certificates issued.
1958-59—87.1— 9 merit certificates issued.
1959-60—90.8—11 merit certificates issued.
1960-61—89.0—12 merit certificates issued.

Pasteurisation of Milk for Cheese.—All but two factories have installed a form of heat unit to treat milk for cheese making. Steps have been taken to ensure that these units are properly equipped to pasteurise effectively. There has been marked improvement in cheese quality from a number of factories since the installation of pasteurisers.

Familiarisation with Fancy Cheeses.—In co-operation with the Queensland Department of Agriculture and Stock, a number of fancy cheese varieties including Havarti, St. Paulin, Cheshare, Broodkaas, Molbo, Tybo and Danish Blue were manufactured at Hawkesbury Agricultural College. This was to familiarise Specialist Officers of this Division with the respective process.

Advice re Equipment and Formulae for Processed Cheese.—Advice was given on the setting up of suitable equipment and by supply of formulae in connection with the manufacture of processed cheese.

A comprehensive ready reckoner for computation of cheese mixtures for processing was prepared by the Livestock Research Officer (Dairy Cattle), and other officers of the Division.

Biological Survey re Staph. aureus.—In co-operation with Biology Branch, Division of Science Services, six lots of cheddar cheese were manufactured at Hawkesbury Agricultural College in connection with the biological survey for *Staph. aureus* in cheese. Several factories' cheese was sampled for a similar purpose.

Cheese Starter Cultures.—Close liaison was also maintained with the Biology Branch in connection with cheese starter cultures.

Cheese-making Competency Certificates.—Operatives of three factories were examined for competency in cheese-making and were issued with certificates. Two of them held other States' certificates for cheesemaking.

Eighteen 2nd Year Dairy Technology students of Hawkesbury Agricultural College were also examined in practical cheese-making.

Eleven visits were made by Specialist Officers to various factories, to investigate defects in cheese quality due to starter problems.

Solids-not-Fat (Content in Milk) Investigations.—The "Solids-not-fat" project mentioned in last year's Report is now fully established. It is in part concerned with the milk of five Departmental Dairy Herds.

All of the herds have now completed at least ten months records. After twelve months the records will be statistically processed to define the various factors apparently associated with this character of milk.

In April, 1961, two solids-not-fat recording units were also commenced in conjunction with the Herd Production Improvement Scheme on twenty private herds. This has been financed by the Commonwealth, from the Dairy Industry Extension Grant. No processable information is yet available, due to insufficient complete lactations.

Bulk Milk Collection Developing.—Bulk milk collection has commenced in several sections of the State in a small way. This method of handling milk is expected to expand rapidly. Two runs will come into operation in the coming year, covering about fifty farms. From this nucleus the expansion will take place.

One large dairy company has organised a trial of several units. It is submitting each unit to conditions adjusted to simulate mid-summer conditions of the respective locality, and is investigating costs and efficiency of operation.

Margarine Quotas and Production.—Quotas for manufacture of table margarine to a total of 9,000 tons were issued to holders of certificates of registration of dairy-produce factories for margarine manufacture. Export to other States was 2,882 tons. Permits to export table margarine overseas to a total quantity of 8,750 tons were issued to firms. Actually, a total of 41 tons was exported.

Factories and Shops Act

Officers of the Division of Dairying are authorised as inspectors under this Act to supervise safety measures within the dairy industry. All possible steps have been taken to ensure conformity with these Regulations. This work has been done in conjunction with normal duties and has not necessitated special visits.

Herd Production Improvement Scheme

Herd Recording Expanded.—The number of herds and the number of cows recorded under the Herd Production Improvement Scheme have increased. Cows recorded totalled 68,000 and the herds 1,340.

Recording staff has been increased from 76 to 89; comprising eight herd organisers, 76 herd recorders and five relief herd recorders.

Calf Marking Scheme.—In all, 10,285 heifer calves were marked under this Scheme. This brought the total of calves marked so far to 79,565. Of the total marked, 976 were bred by artificial insemination and 51 were merit calves.

Certified Bull Scheme.—This year 410 certified bull certificates were issued.

Sire Survey.—Publication of sire survey results continued in our bi-monthly journal *Dairy Topics* and further figures are being correlated for publication.

The Biometrician seconded to the Division of Dairying is investigating methods used in other countries for assessing sire survey results. He will submit an improved scheme for adoption.

Bulls from Department to Artificial Breeding Centre, etc.—The Department has provided one proven sire and two young bulls for use in the Artificial Breeding Centre at Berry.

It also has offered two other young bulls for inclusion in the Milk Board bull-proving programme; whilst fourteen young bulls of all breeds are in process of being progeny tested in the Department's dairy herds.

Government Herds

Production of the five Dairy Cattle Studs has been maintained at a high level.

At Sydney Royal Show, Yanco Agricultural Research Station's Guernsey Stud was the top-producing Guernsey herd, and won the Newcombe cup for the top team of six producing Guernsey cows in New South Wales.

The Hawkesbury Agricultural College Friesian team gained the award for most successful exhibitor in the Friesian Section.

Teams were exhibited from each Stud, and each gained a share of awards.

Some of the Dairy Industry Research

Milking Machine Efficiency Survey.—Five Milking Machine Survey Officers are now operating. This work continued to be of outstanding use to farmers.

Processing of data covering three years and some 2,000 farms has been carried out. Assessment of the figures is now in progress and the results should be available within six months.

The survey has covered all far north coast districts. The growing total of names on the waiting list in all offices of the Division of Dairying has shown how greatly the work is appreciated by the farming community.

Milking Machine "Efficiency" and Mastitis.—A survey into the relationship between milking machine efficiency and mastitis has been initiated.

There has been evidence that the use of antibiotics is masking the situation. It is hoped that in the coming year expansion of the survey on an amended basis will be possible.

Testing Station for Air-flow Meters.—This Station was established at Hawkesbury Agricultural College with the help of Commonwealth funds. It continued to test and service an increasing number of Air-flow Meters from various States. To modernise the Station and provide a more speedy service, special instruments (Rhotameters) are being installed.

Staff for Research.—Dr. S. Bakalor has been recruited as Special Dairy Officer (Research), for research projects approved by and financed by the Australian Dairy Produce Board. He is located at the Hawkesbury Agricultural College.

A start has been made, on problems associated with Blue Vein cheese.

Dr. G. J. Smith, Dairy Officer (Research), is expected to resume duty with the Department in August, 1961, after his period of overseas duty.

Extension Services

Six Dairy Science Schools.—Six Dairy Science Schools were conducted for the tuition and examination of factory operatives for certificates of competency in milk and cream testing and cream grading. Ninety-seven operatives attended the Schools.

Technical Education's School at Newcastle for Factory Operatives.—A short-term school arranged by the Department of Technical Education for factory operatives was conducted at Newcastle by officers of the Division of Dairying. Subjects dealt with included the theory and practice of milk and cream testing and milk and cream grading.

Milking Machine Efficiency, Summer School.—The Division of Dairying co-operated with the Dairy Husbandry Research Foundation of the University of Sydney in conducting a Summer School on Milking Machine Efficiency, at Camden. It was attended by Departmental and industry representatives from every State. This school will have helped a great deal to co-ordinate thoughts and information on milking machine efficiency and milking technique throughout Australia.

Talks by Dairy Officers.—Talks were given and demonstrations were set at dairy farmers' refresher courses, field days, film evenings, Agricultural Bureau meetings, Junior Farmers' Club meetings and other rural gatherings.

Number of Farm Visits for Extension Purposes.—Some [illegible] farms were visited by dairy officers for general extension work. In addition, [illegible] visits were made in connection with Dairy Industry Grant Demonstrations, and [illegible] for herd improvement extension.

Dairy officers travelled by car [illegible] miles in the course of the year's work.

Number of Group and Mass Contacts in Extension Service.—Dairy officers attended for extension purposes [illegible] field days, [illegible] film evenings, [illegible] meetings of Agricultural Bureau branches and [illegible] Agricultural Shows.

Approximately [illegible] radio talks were given.

Circulation ([illegible]) of *Dairy Topics* (bi-monthly) to all dairy farmers in the State continued to be popular. Publicity was also achieved by press articles in local papers, and the Department's weekly *Press Copy* and monthly *Agricultural Gazette of N.S.W.*

Dairy Farm Improvement Competition.—Judging of the [illegible] Competition sponsored by *Country Life* newspaper ([illegible] entries) was conducted by District dairy officers and specialist officers. Preliminary judging of the [illegible] Competition has commenced involving seventy farms.

Commonwealth Dairy Industry Extension Grant.—The [illegible] allocation to New South Wales under the Grant was [illegible].

Granted for promotion of improved practices in the dairying industry, it was expended so far as Division of Dairying activities were concerned, on Grade Herd Recording, Sire Survey, farm demonstrations of dairy-technical nature, the Milking Machine Efficiency Survey and the Testing Station (Air-flow Meters).

Responsibility for establishment and control of farming demonstrations was transferred from District dairy officers to District agronomists, except for a small number of demonstrations concerned with dairy-technical problems. The latter included twelve demonstrations of water cooling towers for cream cooling.

DIVISION OF ANIMAL INDUSTRY

Some Major Animal Health Matters

Swine Fever in New South Wales.—There is now ample evidence that a strain of swine fever virus of comparatively low virulence is present in New South Wales.

The Consultative Committee comprising representatives of the Commonwealth Health Department, the C.S.I.R.O. and the States' veterinary services, at Sydney on [illegible] May, [illegible], weighed evidence and made a presumptive diagnosis of swine fever. To confirm the diagnosis, virulent virus was imported from Weybridge laboratories, England. Challenge tests were done at Glenfield Veterinary Research Station. The pig which had recovered from an inoculation of material secured from a field case, stood up to challenge with the virulent virus. This confirmed the diagnosis.

Further confirmation has been obtained by additional tests of pigs which have recovered from inoculation of infected material and by resistance to challenge of the recovered cases brought in from the field.

The original quarantine area has had to be extended in the Newcastle district to include the whole of the Pastures Protection District of Maitland. By far the majority of cases have occurred inside this area. There is reason to hope that in the main the disease will be contained therein.

It has not been possible to apply transmission and challenge to all suspected cases because of the time taken to reach a decision. Therefore the following criteria as to existence of the disease in a piggery have been adopted:—

(1) Within a Quarantine Area. A positive diagnosis is made if there is a clinical picture consistent with swine fever supported by lesions on post mortem examination and a history which indicates the possibility of infection despite failure to recover significant organisms on culture of suitable material taken from suspected cases. If significant bacteria are found on culture of such material, reliance is then placed on a positive histopathological examination of brain tissue.

(2) Outside a Quarantine Area. In all cases a histopathological examination of the organs is given priority, particularly of the brain, [illegible] and [illegible] [illegible]. Every effort is made to [illegible] [illegible] cases brought in from the field.

Using these criteria twenty-six piggeries have been affected, involving a little over [illegible] pigs. [illegible] of these piggeries are in the Sydney area, [illegible] in the Newcastle area, and three outside the existing quarantine area. [illegible]

Investigations of pig movements both within and outside the area are continuing. [illegible]

[illegible]

[illegible]

Anthrax.—[illegible] outbreaks of anthrax occurred. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Particulars of the testing operations in the quarantine areas are shown in the accompanying table and this is followed by a table showing the testing done under other Schemes:—

Tuberculin Testing in Quarantine Areas

Area	Number of Cattle Tested	Number of Positive Reactors
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		
[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]

Tuberculin Testing under Other Schemes

Programme	Number of Cattle Tested	Nvmber of Positive Reactors
T.B. Free Herd Scheme ..	10,171	19
Tuberculosis Protected Area	2,035	3
Milk Board	10,151	31
Local Government	7,829	33
Miscellaneous	198,588	4,084
Quarantine Area (T.B.) ..	135,488	2,319
Total	364,262	6,489

Bovine Brucellosis, Incidence Pattern.—A survey in the Illawarra indicated infection in 41 per cent. of the dairy herds. This is the probable pattern of infection in dairy herds throughout the State. In beef herds the level of infection is believed to be considerably lower. The Department continued to encourage owners to engage practising veterinarians for Strain 19 vaccinations.

Brucellosis-Free Herd Scheme.—The results of testing done under this were as follows:—15 herds of cattle (1,304 head) tested: one reactor; 23 swine herds tested (390 head): no reactor.

Ovine Brucellosis, Incidence Pattern.—Field investigations indicated this to be widespread, throughout the State; predominantly in flocks of the British breeds, but with a small number of Merino flocks harbouring infection.

Observations supported the view that the disease can be eradicated by effective segregation of ram lambs from older rams known to be infected or which have been exposed to possible infection. No case of spread of the disease from ewe to ram occurred, except in the case of service during the same oestrus by an uninfected ram after service by a ram harbouring the organism. Vaccination is permitted but has not been encouraged, because of its effect on the serological test.

Contagious Bovine Pleuro-pneumonia.—For the third year in succession no outbreak occurred, despite large numbers of cattle from Queensland where the disease is enzootic. The favourable situation has been due to the progress of eradication in Queensland. Nevertheless, two protected areas against the disease were maintained. Action was taken to exclude therefrom any cattle which could have been exposed to infection.

Johne's Disease.—No outbreak was detected. Five properties where cases had been previously diagnosed were kept under observation. Policy keeps infected properties under quarantine for twelve months as from the detection of the last case of the disease, followed by surveillance for five years. Quarantine was lifted from one of the five holdings during the year. It was maintained on another, where there was evidence of infection in a cull bull consigned for slaughter. Surveillance continued over the other three properties.

Footrot of Sheep, Armidale Quarantine Area.—Following the declaration of the Armidale Pastures Protection District as a Quarantine Area against Footrot in Sheep, staff and equipment made available by the Pastures Protection Board were used to determine infected flocks and undertake the necessary eradication procedures. Owners had to notify all cases of clinical footrot, and also report the introduction of any sheep into the area. Regular inspections were done at saleyards, to detect and trace infected sheep.

The disease was found on forty holdings. Twenty of them are now considered freed from infection; and eradication is proceeding on the others. Of the twenty holdings where the disease is now considered eradicated; three were dealt with by treatment only; twelve by treatment, and disposal of chronic cases for slaughter; and five by consignment of the whole flock for slaughter.

Sheep Lice and Ked Campaign.—The campaign against these was stepped up. Intensive inspections were made at saleyards and on individual holdings. Properties carrying affected sheep were quarantined until dipping had been undertaken.

A summary of the work shows that at Flemington saleyards 1,936,657 sheep were inspected and 7,695 were infested; whilst elsewhere 711,970 sheep and 745 properties were infested.

Trichomoniasis in Dairy Herds.—Eight outbreaks were diagnosed in dairy herds. The farms were quarantined until all cattle had completed a normal pregnancy. Bulls that were affected or had been exposed to possible infection were sent for slaughter, with compensation.

The Department inaugurated a special artificial insemination service for infected herds in areas where there was no established insemination centre or sub-centre.

Pullorum Disease, Control Schemes.—This was the first full year of operation of the Stock Diseases Act regulations requiring chickens and hatching eggs sold to be from flocks tested for this disease.

Five outbreaks were detected and were followed up to determine the source of infection.

In addition to the compulsory testing, the Department maintained an Accredited Flock Scheme on a voluntary basis. In this are three grades of Accreditation; Class I: where no reactor is detected, at two consecutive tests on a whole flock at not less than six months' interval, or at three consecutive tests at intervals of thirty days; Class II: where no more than 2 per cent. reactors have been detected, under the foregoing conditions; and Class III: where breeding stock only are tested, with not more than 2 per cent. reactors at the annual test.

The results of testing are shown in the following table:—

	Accredited Scheme	Compulsory Flock Testing
No. of flocks tested	93	222
No. of birds tested	236,042	509,848
No. of positive reactors ..	408	1,826

Infectious Rhinitis of Pigs.—Following the diagnosis of inclusion body rhinitis during the preceding year in South Australia, observations were made on piggeries in New South Wales. As a result, twenty-four confirmed occurrences were met.

Infected herds were widely distributed throughout the State. Because of the benign nature of many infections, distribution of this disease is now regarded as extensive. No case of nasal atrophy has been seen, however.

Muscular Dystrophy of Sheep.—Diagnosed for the first time during the previous year, this again appeared in a number of flocks—particularly in the New England area in sheep grazing improved pastures.

Field trials indicated that selenium administration to ewes prior to lambing completely protected the lambs. Trials to assess effects of selenium administration on the growth rate of lambs were also undertaken. In some trials significant results were obtained. In others there was no difference between treated and control groups. In one case the growth rate of treated lambs was retarded.

Infectious Laryngo-tracheitis, Post-vaccination Losses.—Heavy mortality in a flock of 100,000 birds followed vaccination by means of an autogenous vaccine. This vaccine had been prepared from birds artifically infected by means of ILT fresh tracheal exudate vaccine. From birds which died after vaccination, *Pasteurella multocida* was recovered in pure culture. It was apparent that the vaccine used had been contaminated with the organisms of fowl cholera.

In consequence, consideration has been given to introduction of regulations to prohibit use of other than egg membrane adapted ILT vaccines.

Transmissible Serositis of Cattle.—This name has been applied to a condition (previously referred to as "Ephemeral fever-like disease") affecting cattle in the Liverpool Plains area. It has been enzootic there for a number of years. Isolated outbreaks have also occurred in other parts of the State. The syndrome and gross pathology bear a close resemblance to sporadic bovine encephalomyelitis as described in North America.

Aspects differing from the American condition are a greater tendency to arthritis, and the occurrence of abomasal lesions. These are focal coalescent grey-white lesions up to ¼ in. in diameter, and raised, surrounded by a narrow pale pink translucent perimeter. They occur throughout the fundic mucosa. Within two hours of autopsy the lesions fade away. From a clinical case of the disease a psittacosis-like organism was recovered.

Sorghum almum *Poisoning.*—*Sorghum almum*, although it has cyanogenetic tendencies, is an increasingly popular summer feed in inland parts of the State. It has been regarded as relatively safe because the HCN when present is largely in a bound form. During the summer and autumn, however, a number of mortalities occurred. The stock had been allowed to graze on this crop when, subsequent to stunting due to drought conditions, growth re-commenced after rain.

Diazinon Poisoning of Cattle.—A mortality involving the deaths of nine adult cattle followed the spraying of pastures with Diazinon. The paddock adjoined an abattoir and works effluent was run into it. Heavy Diazinon spraying of the pastures was done to reduce the fly population attracted by the effluent. Symptoms shown by affected cattle comprised profuse salivation, ataxia, muscular spasms and diarrhoea. The salient autopsy finding was an engorgement of the subcutaneous blood vessels.

Veterinary Research Station, Glenfield

VETERINARY DIAGNOSTIC SERVICES

The number of specimens submitted to the Veterinary Research Station for diagnosis continued the increase apparent for many years past. A total of 30,534 specimens was dealt with, compared with 29,419 in 1959-60.

The 30,534 specimens comprised:—18,237 from cattle; 5,434 from sheep; 5,038 from poultry; 1,226 from pigs; 138 from horses; 223 from miscellaneous birds and animals and 238 miscellaneous other specimens.

Specimen Register entries totalled 5,109.

Revision of Handbook—"Collection and Despatch of Material for Laboratory Examination".—This revision has yielded manuscript for the 4th edition, now with the printer. The third edition was printed in 1950. The subject matter has been considerably expanded, and the book will be twice the size of the older edition. The new format will allow supplements to be added, without need to reprint the whole.

Licensing of Laboratories Under the Noxious Microbes Act.—Thirty-three inspections of bacteriological laboratories were carried out in this connection.

ARTIFICIAL INSEMINATION WORK

Bull Testing

Nature of Tests.—Preliminary tests for tuberculosis, brucellosis, leptospirosis and pleuro-pneumonia are done before the animals are accepted at Glenfield Veterinary Research Station. These tests are repeated while the animals are at the Research Station; and freedom from vibriosis and trichomoniasis are also determined—by test mating with virgin heifers. Examination for suitability for artificial breeding purposes is made on those bulls intended for Artificial Insemination Centres. Because the heifers are used once only, there has been difficulty in keeping up a sufficient supply of known virgin heifers.

Number, Range and Sources of Bulls Tested.—Forty-eight bulls, from eight dairy and three beef breeds, were tested. Ten, including one bred in New Zealand, were from Victoria; one was from Queensland and one from Tasmania. The rest, from various studs in New South Wales, included several from Department of Agriculture herds.

Bull Destinations.—Twenty-nine of the bulls went to New South Wales Milk Board A.I. Centres (16 to Graham Park, Berry, and 13 to Aberdeen); 1 went to West Australia for A.I. purposes; 1 (Aberdeen Angus) to Japan; 3 (including one Polled Shorthorn) to Wagga Agricultural College and one (Polled Hereford) to Hawkesbury Agricultural College.

One was returned to Yanco Agricultural Research Station, after test-mating. Two, intended for the Milk Board, were rejected after tests and returned to the owners.

Bulls Withdrawn, Rejected, or Still under Test.—A further two bulls were withdrawn from offer to the Milk Board after preliminary testing. Another was rejected as a result of an unfavourable health test.

Seven more were still at Glenfield, under test for the Milk Board, at 30th June, 1961.

TOXICOLOGY

The various specimens submitted from 192 sources involved 657 chemical examinations for poisonous substances.

Arsenic Poisoning.—134 mortalities were investigated for suspected arsenic poisoning, and 44 were due to arsenic. The known stock losses due to this poison comprised: sheep, 519 head, 10 mortalities; cattle, 72 head, 32 mortalities; pigs, eight head, one mortality; and one horse.

One of the mortalities arose from prickly pear poisoned 18 months before having been eaten by cattle; arsenious oxide concentration of the dead prickly pear was 0.4 per cent.

A post-dipping mortality in sheep was investigated. Although the sheep had been treated in a spray "dip" the arsenious oxide concentration of undried rumen ingesta in four dead sheep was found to be 33.2, 16.4, 14.9, 13.1 parts per million respectively. It has been assumed that ingestion of arsenic from spray dips is unlikely but these figures indicated ingestion. The results of tissue analyses were consistent with the arsenic poisoning diagnosis.

Lead Poisoning.—Sixty analyses were conducted. Five were positive. There has been a notable decrease in mortalities due to lead poisoning in this twelve months.

Mercury Poisoning.—Three mortalities in sheep occurred after grazing grass in orchards which had been sprayed with phenyl mercuric chloride. Kidney mercury concentrations in two sheep were 72 p.p.m. and 129 p.p.m. respectively.

Bismuth.—In three cases bismuth was found in ingesta, presumably a result of medication.

Phosphorus.—Of nineteen cases examined, phosphorus was present in two and was the likely cause of mortality.

Carbon Tetrachloride Effect in Sheep.—Work has continued on analysis of sera from field cases. So far it would seem that kidney function is affected more often than liver function.

Nitrate Effect in Sheep.—Chronic ingestion of potassium nitrate equivalent to 2 per cent. KNO_3 in the diet killed four of five pregnant ewes after 50 to 70 days of treatment. 1 per cent and 0.5 per cent KNO_3 had no effect.

No goitrogenic effect of nitrate was observed and all lambs born were healthy.

Quantitative methods of analysis for nitrate in serum in the diagnosis of field cases of poisoning were studied. A satisfactory method has been developed.

RABBIT MYXOMATOSIS

Virus Release Figures.—Requests for myxomatosis virus increased, but the number of ampoules of virus and rabbit doses despatched from Glenfield Veterinary Research Station remained at about the 1959-60 figures.

Figures for Eleven Years.—The virus release figures for Glenfield Veterinary Research Station for the past eleven years have been tabulated.

Year	Rabbit Doses	Ampoules of Virus	No. of Requests
1960-61	37,300	1,492	288
1959-60	39,000	1,560	181
1958-59	126,625	4,997	653
1957-58	152,425	6,097	661
1956-57	200,200	7,763	742
1955-56	194,200	3,884	542
1954-55	280,850	5,617	673
1953-54	296,900	4,514	558
1952-53	279,200	3,389	....
1951-52	249,600	......	....
1951 Feb. to June	21,600	......	....

Veterinary Station Research—Cattle

FASCIOLIASIS IN CATTLE

A small trial was done in conjunction with the C.S.I.R.O. to determine several aspects of liver fluke infestation.

Six parasite-free calves were dosed with metacercariae of *Fasciola hepatica* and thus artificially infested. The course of the infestation was followed to assess liver functions while young flukes were actively migrating; to determine commencement time of egg-laying and to detect changes serologically. In addition, carbon tetrachloride was administered by oral, subcutaneous and intra-muscular routes to determine blood levels of the drug, effect on liver and kidney function, local reaction to injection and anthelmintic efficiency.

CALF DIPPING TRIALS WITH D.D.T.

A further trial was done in collaboration with Chemistry Branch of the Division of Science Services, to determine the effect of dip concentration on toxicity and deposit of D.D.T.

Twelve calves were dipped in pairs, in D.D.T. baths at different concentrations. The calves showed no ill-effects from the dippings, but no examination of fatty tissue, organs or excreta was made.

Internal Parasite Survey of Cattle

The survey of internal parasites present in cattle passing through the Grafton Abattoirs was suspended in December, 1960. This completed a period of one year during which abomasa and small intestines were taken from six slaughtered calves every two weeks and despatched to Glenfield for examination. The extensive data collected is at present being examined.

Sporadic Bovine Encephalomyelitis

Despite some clinical differences between this condition as described in the U.S.A., and transmissible serositis or ephemeral fever-like disease as has occurred in the Tamworth district for many years, co-operative work with the C.S.I.R.O. has demonstrated these two conditions to be similar serologically. It is probable they are caused by the one psittacosis-like organism (*Miyagawanella bovis*).

The field survey has not yet been completed. Confirmed cases have occurred in the Narrabri district and suspected cases in the Murrumbidgee Irrigation Areas.

Isolation of the organism and preparation of an antigen for the complement fixation test have been major steps in the study of this condition. Antibiotic therapy is to be examined, but practical difficulties in assessing the value of treatment in the field has slowed the progress.

Mastitis in Cattle

Survey of Effects of Milking Machine.—In co-operation with Division of Dairying, the effects of milking-machine efficiency on mastitis incidence (and also the value of Staphylococcal mastitis vaccine, in a number of Departmental herds) are being studied.

Survey of Causal Organisms.—Some 357 milk samples were received from veterinarians throughout the dairy districts. The great majority would have been collected from suspected cases of mastitis or from cows within affected herds.

Examination revealed evidence of mastitis in 202 of the samples (56 per cent.). Staphylococci appeared responsible for 67 per cent. of the cases, Streptococci for 17 per cent. and other organisms for 16 per cent.

Only 38 of the Staphylococci isolations were tested for their coagulase activity and 34 (90 per cent) were positive.

Antibiotic Sensitivity of the Staphs.—The majority of the Staphylococci isolated were tested for antibiotic sensitivity (with "Sentest discs"), with the following results:—

Antibiotic	Number Tested	Number Sensitive	Per Cent. Sensitive
Chloramphenicol	85	84	99
Streptomycin	98	72	73
Tetracycline	85	73	86
Oxytetracycline	85	70	82
Penicillin	98	27	28
Aureomycin	85	82	96
Erythromycin	37	31	84

Milk Fever—Tests of Vitamin D3

The trial (at Wagga Agricultural College) using Vitamin D3 for prevention of milk fever has been concluded. No significant effect was shown.

Bovine Infertility

Sampling of Widespread Incidence.—Apart from serum samples, specimens from 1,828 animals in 169 herds were examined; mostly as vaginal mucus samples in plastic A.I. pipettes.

Of 1,014 samples (129 herds) submitted to the vaginal mucus agglutination (VMA) test for vibriosis, 191 (69 herds) gave significant reactions. Thus, bovine veneral infection is apparently still widespread in New South Wales herds.

Specimens from all 169 herds were examined for *Trichomonas foetus*, and this genital protozoan was found in only four new herds. This suggested that increasing control measures, including artificial insemination, are reducing the incidence of venereal trichomoniasis.

For several reasons it is believed that a great majority of the VMA reactions were due to vibriosis, though there was some experimental evidence of reactions, to the vibriosis test, from Trichomoniasis. These Glenfield Station observations tended to support those reported by the Berry laboratory.

Vibrio fetus Isolation Experiments.—Methods tried for isolation from contaminated specimens included the addition of sulphanilamide and antibiotics, and the use of a vertical tube in sloppy media to trap non-motile organisms.

The sulphanilamide technique has so far shown most promise. Vibrios have continued to grow satisfactorily in concentrations of sulphanilamide that control *Pseudomonas*.

Solid culture media (agar and blood-agar plates) are still used in routine attempts to isolate vibrios, but greater success has been had with a semi-solid (sloppy agar) medium.

Antigens for VMA Vibrio Tests.—Antigen prepared from 1980 strain is used in VMA tests for vibriosis, but at intervals several different antigens are used for parallel tests. Occasionally differences of some significance occur. Further observations are in progress.

In one beef breed case, vibrio organisms were recovered from an aborted foetus. Mucus samples from the cow concerned and from others in the herd proved negative to all tests; except that the former caused agglutination of homologous antigen.

In tests with polyvalent antigens, three was the greatest number which would remain in suspension together. Differences in results with trivalent, as compared with 1980 antigen alone, were insufficient to justify use of the trivalent for routine VMA testing.

Trichomoniasis Treatment Experiments.—A proprietary preparation ("compound 5667"), claimed to have exceptionally high activity against Trichomonas *in vitro*, and moderate therapeutic effect in humans and hamsters, was tried in one experimentally infected heifer and one naturally infected bull. The results were disappointing. There was only a temporary reduction in the number of live protozoa present.

Another preparation ("Trichomycin" (Japan)) also proved disappointing in limited trials. It appears to have no effect on trichomonad population or course of infection when given by mouth; and it only temporarily reduced the number of organisms when administered topically, i.e. foaming vaginal tablets.

Formol-saline (0.3 per cent.) failed to eliminate *Tr. foetus* from the sheath of a bull, and from infected females. It was tried following an observation that trichomonads were killed and fixed very rapidly when vaginal mucus containing them was immersed in 0.3 per cent. formalin (as in preparation for VMA testing for vibriosis).

Glycerol having been found more toxic to *Tr. foetus* than to spermatozoa, it was tried intravaginally (50 per cent. in physiological saline) at various short intervals after service. This was to prevent transmission of infection to the female, without preventing conception. Only one of five females failed to become infected (and this one may have developed resistance through previous infection). Later intra-vaginal and intra-uterine treatments failed to terminate infection.

Glycerol (50 per cent.), intra-preputially, proved unsuccessful in the treatment of an infected bull. Also, high concentrations produced signs of irritation.

Veterinary Station Research—Sheep

Goitre in Lambs

Cause and Treatment Experiments.—Field trials, set up in 1959-60, to assess the effect of various treatments were rather spoilt by the fact that very little goitre occurred in the experimental flocks. However, from iodine analyses of the thyroids, it was apparent that iodised oil injected once a year and monthly drenches with potassium iodate both raised thyroid iodine concentrations.

Goitre was not produced in experiments at Glenfield where pregnant ewes (some from one of the affected properties and some from Glenfield) and guinea pigs were fed hay cut in 1959 from an affected property. This suggested that a goitrogen was the cause of the goitre in 1959, as this hay was harvested only two months after the birth of the goitrous lambs.

Experiments with radioactive iodine 131, on six pasture species collected in 1960, showed no goitrogenicity when the plants were fed to castrated rabbits. This was not surprising, as no goitre occurred in the lambs that year. The work is continuing.

MUSCULAR DYSTROPHY IN LAMBS

Selenium, and Vit. E Treatments of Ewes.—Field trials were conducted to determine whether this disease, first reported in New South Wales in 1959, could be prevented by treating the ewes with Selenium or Vitamin E before lambing. Unfortunately, muscular dystrophy occurred on only one of the trial properties. Results from this property suggest that both selenium and vitamin E may be effective in preventing the disease. The selenium would be more effective, as judged by the serum glutamate oxalacetate transaminase analysis.

Nine field trials were also set up to assess the effect of selenium on the growth rate of lambs. No effect was obtained on seven of the properties; but growth rate increases were significant on two properties—in four to six week old lambs. On one of these properties a further trial was conducted, on four and a half month old lambs. This also gave positive results.

PREGNANCY TOXAEMIA

Further to earlier work at Glenfield, an attempt has been made in collaboration with the C.S.I.R.O. to see whether hypoglycaemia in sheep causes a release of adrenalin.

The results of experiments with one technique suggested that unlike other species, no release of adrenalin occurred in sheep during hypoglycaemia—although a release could be elicited by frightening the sheep or by changes in the feeding routine.

Subsequent experiments, with a different technique, contradicted these findings. Work is in progress to resolve the differences.

ITCH MITE TREATMENT TRIALS

The new, covered sheep pens (from Wool Research Trust funds) were used for trials of relative efficiency of certain insecticides against sheep Itch Mite. Sheep were screened in September, 1960, and eighty heavily infested were selected. These were divided into groups. Each group was treated by plunge-dipping in CX99 and arsenic at various concentrations. One group was not treated and kept as a control. All were held in isolation. Skin scrapings were examined at regular intervals to assess the effect of the treatment. The trial will continue until October next—twelve months after treatment.

LICE INFESTATION IN SHEEP

The recently installed shower was used to treat lice infested sheep with Aldrin. Different periods of exposure were used to determine efficiency of the insecticide so applied. Observations, including effect on the wool, are continuing.

ANTHELMINTIC TRIALS WITH SHEEP

Some new anthelmintics were tested; including Quinazine Toluene Sulphonate, Phenothiazine, Asuntol and Thiabendazole. Groups of worm-free sheep were dosed with parasite larvae and, when a heavy infestation was established, treated at various dose rates.

These trials were at Glenfield and in the country. In most cases the sheep were slaughtered and examined post mortem. Results will be published in due course.

Other trials included a study of the effect of sulphamezathine on Coccidiosis; and the cause of toxicity produced by Phenothiazine.

Thiabendazole proved an outstanding anthelmintic; nearly 100 per cent. efficient against the three important round worms of sheep—Haemonchus, Trichostrongylus and Oesophagostomum. This is the first critical trial on this substance in the world.

The results have been reported in a paper shortly to be published.

OVINE BRUCELLOSIS

Complement Fixation Tests.—During the year 3,285 complement fixation tests were conducted (100 anticomplementary).

In late 1960 unsatisfactory results were obtained when tests were conducted in perspex haemagglutination trays. These appear to have aged and possibly absorbed deleterious substances. New equipment has allowed the test to be modified to its present form, conducted in glass test tubes. Comparable totals of sera can now be tested, more comprehensively. No difficulty or inconsistency has been encountered with the current test.

Experiments to further standardise the test, by use of photometric standards, have been conducted. It has not yet been possible to apply the results to routine testing.

Transmission.—Small-scale experiments have been started, to observe transmission of the disease from ram to ewe and from ewe to ram, and to examine the persistence of titre and possibly infection in progeny of reacting ewes.

SHEEP DROUGHT FEEDING RESEARCH

(Glenfield Station in collaboration with C.S.I.R.O.)

Utilization of Low Quality Roughage

Roughages with Differing Protein Content Compared.—This trial was concluded in October, 1960.

Four-tooth merino wethers were fed *ad lib* low-quality roughage of 2.7 per cent. crude protein, with and without a supplement of 3 oz. of wheat fed daily or twice weekly. Other groups of merino wethers of the same age were fed mixtures of low-quality roughage and lucerne chaff, making the crude protein content 5.2 per cent. and 7.6 per cent. These mixtures were fed alone or with the wheat supplement.

No sheep survived to the end of the 20th week in the unsupplemented group fed the 2.7 per cent. crude protein roughage, and 44 per cent. survived to the end of the twenty-sixth week in the unsupplemented group fed 5.2 per cent. crude protein roughage. No loss occurred where the roughage with higher crude protein content was fed.

The feeding of 7.6 per cent. crude protein mixture was compared with feeding cereal chaff of the same protein content, with and without the wheat supplement. The intake of cereal chaff was higher in all cases, and, when the intake of cereal chaff was restricted to that of the 7.6 per cent. protein roughage mixture, the group fed the cereal chaff showed greater body weight gains. However, there was no significant difference in the per cent. of survivors—between 90 per cent. and 100 per cent.

There was a slightly greater number of survivors in the twice-weekly supplemented groups than in the daily supplemented groups when the 2.7 per cent. crude protein and 5.2 per cent. crude protein roughage were fed, but the body weight losses were less in the daily supplemented groups.

In all groups except those fed cereal chaff, groups which received the wheat supplement had more survivors and a smaller body weight loss. In the groups fed cereal chaff, the unsupplemented group had an increased intake of roughage which may have nullified the effect of feeding the supplement.

The group fed the roughage mixtures, containing 5.7 per cent. and 7.6 per cent. crude protein, had a greater low-quality roughage intake from the mixture than the group fed the low-quality roughage alone. This trend was evident in both the supplemented and unsupplemented groups.

Maintenance Needs for Some Breeds

A trial investigating the maintenance needs for Polwarth, Corriedale, and Border Leicester X Merino was concluded in May, 1961.

The level of energy fed was based on the mean body weight of the groups at randomisation and was equivalent to 55 per cent. of Woodman's Figures. This meant that the sheep were fed the following number of starch equivalent per week:—

Polwarth ...	4.7	Maintenance Level (M.L.)
Corriedale ...	5.1	
Border Leicester X Merino	5.3	

Two other levels of energy were also fed: A—a Sub-Maintenance Level (S.M.L.), and B—a Sub-Sub-Maintenance Level (S.S.M.L.).

	A. (S.M.L.)	B. (S.S.M.L.)
Polwarth	3.7	2.7
Corriedale	4.1	3.1
Border Leicester X Merino	4.3	3.3

The trial continued for six months and the groups were all fed a 50-50 mixture of wheat-wheaten chaff plus 1½ per cent. limestone.

At the M.L., the Polwarth and Border Leicester groups lost approximately 5 per cent. of their original weight. (The Corriedales lost 9.3 per cent. of their original weight, but there was some loss of feed from their self-feeder during the first five weeks of the trial. In the light of results at the lower levels, and performance from the fifth week, it would appear that the loss would have been about 5 per cent. also.) There was no loss in any of these groups.

At the S.M.L. and S.S.M.L., a summary of the per cent. survivors of the groups fed at the lower levels is as follows:—

	S.M.L.	S.S.M.L.
Polwarth	100	88
Corriedale	100	81
Border Leicester X Merino	97	94

At the lowest level (S.S.M.L.) the crossbreed performed better, in both per cent. survivors and loss of body weight. There was approximately 25 per cent. loss of body weight in the Polwarth and Corriedale groups, whilst the loss was only 20 per cent. in the Border Leicester X Merino group.

The per cent. figures for loss of body weight have not as yet taken greasy fleece weights into consideration. Greasy fleece weights of the groups have not been fully analysed. However, the indications are that at the maintenance level the Corriedale group cut 1-1½ lb. more than the Polwarth, whilst at the lower levels the Polwarth wool cut was at least as heavy as the Corriedale.

Further investigations, studying the drought recovery of these groups, are in progress.

The maintenance levels fed during this trial seem to be very near the level required for the breeds, although there was some loss of weight. At the start of the trial the sheep were in store to forward store condition, and there was some loss of body weight and condition during the first few weeks. Thereafter, the body weight figures were relatively constant.

Recovery of Drought Subjected Ewes

This trial was programmed to finish at the end of June, 1961. The lambing performances were as follow (per cent. lambs):—

	1st Lambing Per cent.	2nd Lambing Per cent.
Group 1	73	82.5
Group 2	89	86.1

Group 1: was mated immediately after 6 months drought feeding.

Group 2: had a recovery period of 5 months (after 6 months drought feeding) before mating.

The results indicated that the intensity and longevity of the drought was sufficient to affect the ewe fertility and lambing performance (Group 1, 1st mating), but that the effect was now of permanent nature.

Behaviour of both groups of ewes at the first lambing was observed closely. The mothering instinct was poor; little attention was given to the lambs in many instances. The ewe seemed to carry sufficient milk for upbringing of the lamb, but at the slightest disturbance was reluctant to shepherd the lamb. This behaviour was not noticeable in the second lambing of either group. The drought feeding effect on the ewe seemed sufficient to cause some upset in her mothering. Per cent of lambs weaned from the first lambing of both groups fell away by over 25 per cent. as a result of the poor mothering of the ewes.

Recovery of Merino Wethers on High Energy Ration

Forty merino wethers had been fed low-quality rations for six months and were allowed to recover on a high-energy mixture (one-sixth lucerne chaff, one-sixth wheaten chaff, one-third millet and one-third barley) fed *ad lib* for twenty-six days.

Approximately 10 lb. of mixture was required for every 1 lb. gain in liveweight. Mean liveweight increased from 71.2 lb. to 80.5 lb. The amount of feed to provide the body weight increase was high and would be costly if the fodder was purchased.

A reasonable conclusion was that for such purposes as condition for market it may not be economic to place sheep solely on a high-quality hand-feeding programme immediately after a drought.

Feeding Trefoil Seed

In a seventeen-weeks' trial, two groups of merino wethers were fed a low-quality roughage (2.6 per cent. C.P.) *ad lib* with a supplement either of 4 oz. of linseed meal or 4 oz. of trefoil seed per head per day.

Crude protein content of the linseed meal was 40.5 per cent. and the trefoil seed 38.3 per cent. Linseed meal was used as the comparative because it has been recognised as one of the best types of feed in terms of energy and protein combination.

Intake of straw was the same for both groups. The group fed linseed meal lost 3.9 lb. less than the group fed trefoil seed. None died.

Although inferior to linseed meal, the results for trefoil seed showed it to be worth high regard as a concentrate.

Veterinary Station Research—Pigs

Swine Fever Diagnostic Methods

Diagnostic System Other Than Transmission Needed.—The current strain of virus is so attenuated that field diagnoses are uncertain, and laboratory transmissions frequently not apparent. Reactions of pigs experimentally infected with the New South Wales virus have been most erratic. In fact, a virulent virus had to be obtained from overseas to confirm initial suspicions of swine fever. Resistance to virulent virus challenge is at present the only reliable diagnostic technique.

The nature of the present disease, with comparatively slow rate of spread in a piggery and, frequently, low morbidity and mortality rates, implies that very few piggeries could be guaranteed as free of infection. Thus it is imperative that a means of diagnosis other than by pig transmission be sought.

At a conference in Paris earlier this year it was stated that transmission work using susceptible and immunised pigs was the only certain method of diagnosis, but that the gel diffusion and END (Exaltation Newcastle Disease) tests had shown promise and should be further studied. This conference apparently did not consider the recent findings at Cornell, U.S.A., where a cytopathogenic strain of S.F. virus has been discovered and the very promising serum neutralization test is being examined as a diagnostic aid.

A preliminary examination of some of the published laboratory techniques has been made at Glenfield. Brief reference to those being used or studied is provided:—

Brain Histopathology Method.—Early in the outbreak, when transmission trials were commencing, Dr. Loomis, Veterinary Pathologist, University of Sydney, examined material from typical cases and reported that the histopathology of the brain was consistent with swine fever. Both U.K. and American workers have considered this type of examination to be a useful aid to diagnosis. (Dr. Loomis continued to examine brains from suspected cases until a Glenfield pathologist gained experience with the histopathological examination). Although the lesions found in the brain are not specific for swine fever they are considered to be of viral origin and, if associated with bowel lesions, a tentative diagnosis is fairly sound.

Jones and Doyle (*J.Am.Vet.Res.* 1953) showed encephalitic lesions in 90 per cent. of swine affected with hog cholera but also found lesions present in 27 per cent. of swine affected with other diseases. The latter become more important in confusing the diagnosis with false positive as the incidence of swine fever decreases. The 90 per cent. accuracy quoted may not apply to the local strain, and contingencies arising in the examination of a large volume of material might further reduce the accuracy.

In the New South Wales eradication programme, the brain histopathology has been used primarily to select properties for intensified further observations and transmission work. On some properties where field evidence has been suggestive, the brain histopathology diagnosis has been accepted as sufficient and slaughter-out of the piggery has proceeded.

Gel Diffusion Tests.—Preliminary Glenfield work with this precipitin test, which in its standard form is designed to detect tissue antigen, had given negative results with local strain material. Following a report from Weybridge, United Kingdom, that positive pancreas tests were not obtained with the New South Wales virus this method did not appear very hopeful.

However, further work has shown some promise for the test in two slightly modified forms:—(I) *a direct serum test* in which at least some New South Wales strain recovered sera react with virulent strain antigen; and (II) *an indirect serum test* in which New South Wales strain recovered serum is used to neutralize virulent strain antigen and so inhibits its reaction with a strong precipitating serum.

Serum Neutralization Tissue Culture Technique.—The work at Cornell, U.S.A., published in 1960, appears to be a particularly promising approach to a suitable diagnostic laboratory test. Convalescent "paired" sera from New South Wales pigs were sent to Cornell, and the preliminary report indicated that in most cases the New South Wales swine fever pig sera have neutralized the cytopathogenic effects of the Cornell strain of virus. This strain has now been introduced to Parkville for examination.

TOXIC JAUNDICE OF SWINE

Since 1954 some swine mortalities have shown features of gross- and histo-pathology typical of toxic jaundice. The disease has been confined to animals three to six months old during the period June to October. It has been most observed in the Young area. After a brief clinical course, animals die with lesions of jaundice and widespread haemorrhages.

Histopathology of the liver suggests poisoning by pyrrolizidine alkaloids and, as mortalities are associated with grazing on Paterson's Curse, poisoning by that plant is the suspected cause. To test the hypothesis a feeding trial has been commenced.

Veterinary Station Research—Poultry

INFECTIOUS LARYNGO-TRACHEITIS VACCINE EXPERIMENT

A pilot trial was reported in the 1959-60 Annual Report. The full trial involving 1,300 birds was carried out between July, 1960, and May, 1961.

Estimation of Dose Response Curve.—This first part of the trial was undertaken in conjunction with the National Biological Standards Laboratory, Canberra. The results appeared satisfactory. Concentration of virus in the vaccine, to ensure protection of 90 per cent. of the birds, should be approximately 106 PFU (pock forming units) per ml. Canberra assays of several commercial egg-adapted vaccines have shown some batches have been ineffective.

This experiment has provided data to define an acceptable standard of the vaccine.

Egg-adapted vs. Fresh Tracheal Exudate Vaccines.—This second part of the trial was to estimate the immunogenic capacity of the two types. It could not be completed satisfactory because of an outbreak of coryza among the birds of the egg-adapted vaccine group just prior to the second challenge, twelve weeks after the vaccination. Also, nearly 200 vaccines were lost to crows and foxes. This made the third challenge, sixteen weeks after the vaccination, impossible. Results of the first challenge, made eight weeks after the vaccination, suggested no difference in capacity of the two types of vaccine.

FOWL CHOLERA

Contaminated I.L.T. Vaccine.—Two heavy mortalities among laying fowls occurred in May, 1961, a few days after the birds were vaccinated against I.L.T. with a fresh tracheal exudate vaccine. Two samples of vaccine used on two consecutive days proved to be heavily contaminated with *Pasteurella multocida.* The same organism was recovered from all dead birds submitted for examination. The strain of *Pasteurella* appeared to be almost non-pathogenic for the young stock, whilst very pathogenic for the laying hens.

In one outbreak, 84,400 birds of different ages were vaccinated; resulting in very severe morbidity and moderate mortality only among the layers. The number of laying hens vaccinated was 32,000; and 2,500 were lost. In the second outbreak, 2,000 hens were lost; from 2,500 vaccinated.

VIRUS FROM DUCKLINGS' ENCEPHALITIC SYNDROME

Bacteriological examination of the one case recorded this year was negative. Virus possibility was therefore investigated.

A virus was isolated after five egg embyro passages. Isolation of pure virus was prevented by fungal contamination of subsequent passages; but fungicidal drugs have been obtained, to purify the original culture for further research work.

AVIAN MONOCYTOSIS PREVENTION/TREATMENT

Incidence of avian monocytosis declined, and morbidity of the disease in respective outbreaks was lower. Progressively popular reduction or replacement of animal proteins with vegetable proteins in poultry rations and introduction of Potassium citrate treatment have helped.

The speculated responsibility of animal proteins (meat meals) for avian monocytosis condition is supported by farmers' claims that the disease has been almost eliminated from the respective flock since they stopped using meat meals in ration mixtures.

The observation concerning Potassium citrate treatment is its superiority over any previous one (molasses and antibiotics). It yields recovery of birds already in the advanced stage of the disease, birds that would be lost under other treatments.

The research programme in avian monocytosis will further explore the toxic meatmeal factors hypothesis. Feeding and inoculation trials are proceeding.

Sheep and Wool Industry Research—Trangie Agricultural Research Station

MATING TIMES AND LAMBING

(*a*) Autumn 1960 Mating.—Four hundred and ninety ewes were mated by artificial insemination, commencing March 3rd. A.I. continued for 3 weeks and was then followed by 3 week's backstop joining; 84.5 per cent. of lambs were subsequently marked.

Paddock matings resulted as follows:—Stud—Ewes mated, 272; lambs marked, 90.6 per cent. Fertility Flock—Ewes mated, 278; lambs marked, 109.5 per cent. Poll Experiment Flock—Ewes mated, 210; lambs marked, 100.0 per cent. South Australian Flock—Ewes mated, 100; lambs marked, 73.0 per cent.

This lambing is a combination of a spring joining as in South Australia and an autumn mating as at Trangie. In general, the autumn joining produced satisfactory results. Marking percentages would have been much increased if neonatal losses of lambs had not been so high—estimated 20 to 30 per cent.

(*b*) Spring 1960 Mating.—Ewes mated, 1,207; lambs marked, 65 per cent.

Every effort was made to lift lambing percentage:—(i) Joining was delayed to late September so that February lambing was avoided; (ii) ewes joined in excellent physical condition; (iii) mating was for eight weeks to reduce the influence of reduced oestrus incidence from the October joining.

The results show that lambing percentage remained at the usual level. Also no extra lambs were produced as a result of the additional two weeks joining. The later joining was associated with much less trouble at lambing time. However, October matings carry severe management disadvantage at Trangie because of the barley grass problem.

A resultant decision has been made to change the Trangie mating to a total autumn joining.

BREEDING INVESTIGATIONS

The Experimental Flocks

1. *Selection Demonstration* (*S.D.*) *Flock.*—This consists of a ram-breeding "Nucleus" of 300 ewes and a "Flock" of 500 ewes. It is maintained with the aim of breeding a high-producing, medium-woolled flock by incorporation of fleece measurement into the selection programme.

During selection, clean-fleece-weight is the most important factor considered. There are independent culling levels for excess skin wrinkle, heavy face-cover and a low number of crimps-per-inch.

The S.D. flock was drawn from what was originally the "Second Stud", prior to commencement of experimental breeding work at this Station in 1943.

2. *Lustre Flock.*—In 1960, a section of the S.D. flock was mated to "lustre mutant" rams. This has initiated a breeding programme to study the influence of the lustre gene on production characteristics; and, in particular, its influence on fleece weight selection.

3. *Stud Flock* (*Regd. Flock No.* 78).—This group is maintained for comparison with the S.D. flock. In the Stud, ewe selection is by visual appraisal only. Ram replacements are regularly purchased (300-500 guineas) from a parent stud of the Peppin strain. This flock is a continuation of the original "Top Stud" ewes. It was commenced in 1912.

4. *Eight Selection Groups.*—Eight small flocks have been maintained since 1952; each consisting of 100 ewes mated to 5 rams. Single-character selection is practised for and

against clean-fleece-weight, crimps-per-inch, weaning weight and skin folds. Groups for and again face cover were commenced in autumn, 1959.

5. *Random Flocks.*—Two hundred ewes mated to 20 rams were set aside as a control for the selection experiments. Selection of ewes and rams is at random. At present the flock is in two equal parts, 100 ewes being mated in spring, and 100 in autumn. Thus, flocks mated at different times of the year are compared.

6. *Fertility Flock.*—In autumn, 1959, a flock of 300 ewes and 6 rams was established; to estimate the fertility of Trangie Station's strain under optimum conditions of breeding and management.

7. *South Australian Flock.*—In 1960, an initial purchase of "Bungaree" blood ewes and rams was made. With further purchases in 1961 and 1962, a 500 ewe flock will eventually be built. Initially, breeding will be at random. After calculating genetic parameters, selection groups will be established. Comparison of the production of the South Australian flock, relative to the Peppin, will also be of major interest.

Tabulation of Time of Mating for all Flocks.—The tabulation is as follows:—

Autumn Mated—
(1) Stud.
(2) Fertility Flock.
(3) "Folds plus" Selection group.
(4) "Folds minus" Selection group.
(5) "Weaning weight plus" Selection group.
(6) "Weaning weight minus" Selection group.
(7) "Face cover plus" Selection group.
(8) "Face cover minus" Selection group.
(9) Random Flock: Autumn Mated.
(10) South Australian Flock.

Spring Mated—
(1) Selection Demonstration Flock.
(2) "Fleece plus" Selection group.
(3) "Fleece minus" Selection group.
(4) "Crimps/inch plus" Selection group.
(5) "Crimps/inch minus" Selection group.
(6) Random Flock: Spring Mated.

OBSERVATIONS ON RESULTS OF THE BREEDING INVESTIGATIONS

Fleece Measurements Results for 18-months-old Ewe Progeny.—The results for these flocks, afore-listed, at the 1960 shearing (June) clearly support the genetic parameters calculated by F. H. W. Morley (C.S.I.R.O.), viz.:

(i) High heritability of fleece weight and its component measurements.

(ii) Strong negative correlation between clean fleece weight and crimps per inch.

(iii) Low correlation between fleece weight and body weight.

(iv) Positive association between high crimps, high folds, reduced body weight and fleece weight.

Face Cover Relationships.—An analysis was made, using data obtained from the 1957, 1958 and 1959 Random flocks. Within reason, within year, phenotypic correlation between face cover and various characteristics were calculated.

The analyses showed that face cover is phenotypically independent of folds and fleece weight; and increased face cover is associated with smaller body weight and increased weight of belly wool.

Weaning-weight Selection Groups.—The analysis of selection changes in this group of flocks, has been commenced. Environmental influences on weaning weight are of great importance. Therefore initial critical estimates of these effects have been made and correction factors established, so that data may be standardised.

Concerning heritabilities the initial conclusions are:—

(i) The realized heritabilities are moderately low, and agree very closely with the theoretical heritabilities calculated by Morley (C.S.I.R.O.).

(ii) There is little evidence that body weight is controlled by sex-linked genes, as suggested by Bielharz (N.S.W. Department of Agriculture).

Production of Twin v. Single Lambs.—The clean wool production of hogget ewes born in the autumn-mated portion of the Random Flock was analysed, to examine the production of twin lambs.

The weighted mean difference between twins and singles was 0.03 lb. in favour of the twins. Thus, under Trangie conditions there is no evidence of a permanent maternal handicap.

This finding is of particular importance in relation to increased fertility resulting from breeding or management. Any improvement must be largely based on increased levels of multiple births.

FLEECE MEASUREMENT

Method to Predict Greasy Fleece-weight in Hogget Rams.—Except for the fine wool studs, most flock rams are sold in wool before their two-tooth shearing. There is therefore an obvious need for a technique to predict fleece weight in hogget rams; a technique which is rapid and accurate but leaves the fleece on the ram for inspection by buyers.

A pilot trial has been conducted with these aims in view. A group of twenty-seven 15-month-old rams, carrying eight months' wool was sampled in the following ways:—

(*a*) a strip 9 in. long was shorn off the right mid-side with the shearing machine.

(*b*) as above, for left hand mid-side.

(*c*) commencing between the shoulder blades, a vertical strip down the shoulder and off the foreleg was shorn.

Subsequent analysis showed a 0.7 correlation between sample weight and greasy fleece-weight at shearing four months later. The right mid-side strip, was a little more accurate than the other two. The addition of body weight increased the correlation to 0.81.

This level of accuracy equals that of the time consuming sampling procedures described in the literature. The indications are that it is about ten times as accurate as visual classing in predicting greasy fleece weight.

Beacuse of the promising results, a more comprehensive experiment has been started (May, 1961).

RESEARCH ON EFFICIENCY OF WOOL GROWTH

Feed Conversion Experiments

Association of Fleece-weight and Feed Conversion Efficiency.—The efficiency of wool growth has been estimated in Experiment I (completed in August, 1960); using groups of unselected hogget ewes from our "Fleece plus", "Fleece minus" and random selection groups. Feeding was for a twelve months period using, *ad lib*, hammer milled lucerne hay in pens. Comparison of these groups gave a measure of the genetic association between fleece weight and efficiency in the Trangie Station's strain of Merino.

It was shown that under the *ad lib* feeding, superior production of the "Fleece plus" selection group is due both to increased appetite and increased efficiency of conversion of feed to wool. In the same way, the reduced production of the "Fleece minus" group is due to a combination of reduced intake and lowered efficiency of conversion.

The other important results, in summary, were:—

1. Under *ad lib* feeding, there was very little change in rate of wool growth during the experiment. There was an underlying complex of factors associated with this result:—

(i) feed intake declined significantly throughout experiment;

(ii) as feed intake declined, efficiency of conversion increased so that total wool growth was unchanged;

(iii) fibre-diameter and fibre-length showed significant seasonal changes, with a negative relationship continually operative, so that fibre volume remained invariant.

2. There was a highly significant + 0.736 correlation between body weight and feed intake, within groups.

Relative Efficiencies on High v. Low Quality Feed.—In Experiment II (completed in February, 1961) twenty maiden ewes from "Fleece plus", Random, and "Fleece minus" selection groups were used. These ewes were fed a good quality ration, *ad lib*, for six weeks. An immediate changeover to poor quality feed *ad lib* was then made, using a four weeks changeover period and a further six-week experimental period.

The two feeds used were pelleted lucerne hay (20.3 per cent. crude protein and 19.0 per cent. crude fibre) and cereal chaff (5.9 per cent. crude protein and 35.0 per cent. crude fibre).

The conclusions were:—

(1) On the high quality diet, the intake of dry matter was almost twice as high as on the poor diet. Difference in protein intake was of the order of five times.

D
C
B
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SUPER
GRADE

Fleece-measurement for Flock-improvement

At field days and short-term schools the advisory service is emphasising the need for fleece-weight records, as against guess work, as an aid to selection and culling for flock-improvement.

(2) Wool growth declined to one-third, mainly due to marked changes in fibre diameter.

(3) On the high quality feed, the genetic superiority of "Fleece plus" sheep was very marked. However, on the reduced intake of poor quality feed, there was little difference in the efficiency of the three groups.

This finding, if it holds in the field, could be of great importance.

INVESTIGATION OF THE POLL GENE

(i) *Phenotype and Genotype of Poll Rams.*—Twenty-three ram lambs have been produced from matings between homozygous polled Merino rams (*PP*) and heterozygous polled ewes (*Pp*). The genotype of the ram lambs was established by progeny testing, and genotype and phenotype were compared.

At birth, seven out of nine *PP* ram lambs showed clean depressions at the horn sites, whereas all of 14 *Pp* ram lambs showed knobs set in depressions.

At 15 months of age, the range of phenotypes was:—

PP rams: Least expression—a small knob set in a depression—horn growth. Greatest expression—a scur half an inch long (horn volume, 0.012 cu. in.) attached to a large knob set in a depression.

Pp rams: Least expression—a scur ½ in. long (horn volume, 0.180 cu. in.) set in a depression. Greatest expression—a scur 8 in. long (horn volume, 12.4 cu. in.) with absence of depressions.

This information has relevance to the establishment of Poll Merino flocks, as follows:—

(*a*) The majority of *Pp* rams can be diagnosed at lamb marking by the presence of horn growth or large knobs set in depressions.

(*b*) The measurement of horn volume at 15 months of age will differentiate *Pp* and *PP* types with accuracy equivalent to a complex progeny testing scheme involving 5 lambs per sire.

(ii) *Association of Poll Gene and Wool Production.*—Results from Trangie have shown a sex-genotype interaction; such that poll rams (*Pp*) tend to produce more wool and be heavier at 18 months of age than their horned half brothers (*pp*.)—whereas with ewes the difference is reversed.

To explain these results, it is postulated that the poll gene has a slightly deleterious effect against the background genotype of the horned Merino. In the ram, this deleterious effect is nullified by the nutritional benefit resulting from the lack of horns.

In an experiment to test this hypothesis;—

(i) approximately 400 *pp* ewes were group mated to poll rams of genotype *Pp*;

(ii) at marking time, the ram lambs produced as a result of this mating were divided into polled and horned groups, half of each group being castrated.

If the hypothesis were correct, then horned wethers should out-produce polled wethers, whereas with the rams the difference should be reversed in favour of the polls.

These rams and wethers were shorn in January 1961, and the measurements of greasy fleece weight and eighteen months body weight were taken. Although the figures on greasy fleece weight were against the hypothesis, there was a tendency to an interaction with body weight and the interaction on death rates between marking and eighteen months was highly significant. Heavy losses (mainly Nematodirus, post-weaning) in polled wethers and horned rams may have eliminated lambs of poor vitality, which, if they had survived, would have caused a marked drop in group means.

The results are of such potential for the ram breeder that a repeat of this experiment was commenced in autumn, 1961. In this experiment, information on the inheritance of the aberrant horn characteristic of heterozygous polled rams will also be gained.

(iii) *Dehorning Ram Lambs.*—For years, a simple method of dehorning ram lambs at marking time has been sought; for two reasons: (*a*) to investigate the hypothesis that lack of horns is an advantage to rams, and, (*b*) if polled rams are desirable, then a simple dehorning operation at marking time would enable their production by a Merino breeder—without need to establish a poll stud.

This Trangie project has until now met with little success. Surgical removal at lamb marking was promising but the skin growing in over the horn sites still retained the power to organise keratin. Complete removal of the horn core, blood supply, etc. was obtained but horn growth from the skin assumed massive proportions in some cases.

Now, the value of a second operation at weaning is being tested. Preliminary results indicate that horn growth may be effectively reduced by this method.

Ram Fertility

(i) *Environmental Effects on Semen Quality.*—In an experiment commenced in October, 1960, the semen of pen-fed rams is to be examined over twelve months. These rams are in two groups; one with normal and one with reversed season lighting. Semen quality is also being measured, in a third group of rams—run under normal paddock conditions. Half these rams are shorn in June and the remainder in June and January.

The extensive range of semen tests includes:—pH, motility, longevity, percentage abnormal and dead sperm, sperm count, initial fructose and fructolysis index.

Initial results indicated a general summer depression of semen quality, irrespective of light treatment. Depression of semen quality has been partially arrested in the summer-shorn group. No severe case of seminal degeneration has occurred, but this must be considered relative to the mild summer experienced.

A marked photo-periodic effect became apparent in March-April, 1961. The rams on the spring lighting regime showed marked seminal degeneration relative to those housed with normal lighting.

The paddock-run rams showed a marked drop in semen quality during the summer, with recovery in the autumn. This trend occurred irrespective of summer shearing.

(ii) *Fertility of Polled vs Horned Rams.*—Since 1955, extensive data involving 33 rams, each mated to 50 ewes, have been accumulated. The results are essentially negative.

Further field investigations must be made, to reach a reliable conclusion. To accomplish this without interfering with Station resources, comparative trials on the properties of co-operating graziers will be arranged.

Ewe Fertility

(i) *Season Effect on Ovulation Rate and Lambing Percentage.*—Examination of seasonal variation in ovulation rate has shown a peak level (1.7 ova per ewe) in March-April, gradually falling to a trough (0.9) in December.

Data from a series of autumn and spring matings over the years 1953 to 1959 was also compared; 37 per cent. more lambs were mothered to the autumn matings. The relative importance of factors explaining this difference, is as follows:—Incidence of oestrus—11 per cent, pattern of oestrus—5 per cent, incidence of multiple ovulation—57 per cent, and conception rate—27 per cent.

The major importance of ovulation rate as a determinant of lambing percentage under Trangie conditions is stressed, particularly since influence of conception rate could be mainly an associated effect of multiple ovulation.

The district preference for spring mating remains unexplained, as there was little difference in growth rate between lambs on either drop. On the average, 55 lb. of lamb was weaned per ewe mated in the autumn, compared with 33 lb. per ewe mated in the spring.

A marked increase in lambing percentage could be obtained in central-western New South Wales simply by joining rams in autumn rather than in spring.

To obtain an estimate of seasonal changes in ovulation rate from other areas of the State, a co-operative experiment is being done with a veterinary officer at Homebush Abattoirs. With the help of several agents, lots of Merino ewes coming up for slaughter are identified, and a questionnaire asking for details of breeding, age, mating history and pastoral history is forwarded to the owners. At slaughter, approximately 50 genitalia are collected per lot, placed in a collection box, and then frozen. When a questionnaire is returned, the genitalia are forwarded to Trangie for examination.

There are many variables to be considered in weighing results of this survey, but since March, 1959, some 2,000 ovaries have been examined from Peppin Merinos from two areas of the State—north-western plains and central-western plains.

The analyses revealed highly-significant differences in percentage of multiple ovulation between districts and seasons of the year. Districts did not differ in percentage of ewes not ovulating, but seasonal effect on the measurement was highly significant.

Relative to the significant difference in ovulation rate between areas, it was noted that pastoral conditions were much more severe in the north-west than in the central-west during 1959.

(ii) *Survey of Incidence of Cystic Endometrium.*—In conjunction with the ovulation rate survey using abattoir material, the ewe genitalia have been examined for incidence of cystic endometrium. Very few cases of grossly-affected genitalia were noted, but ewes showing low counts of small cysts were very common over the plains area surveyed.

With Peppin Merino flocks, the incidence of effected ewes showed a wide variation between flocks—0 to 40 per cent. (overall average). Average incidence per flock was significantly higher in the central-west, relative to the north-west—15.2 per cent. *vs* 10.9 per cent.

These results are of interest for several reasons, including:—(*a*) subterranean clover is practically unknown through the region surveyed, although *Medicago* spp. are important pasture legumes there, and, (*b*) no grazier has complained of poor lambing percentages. Graziers may of course be putting up with sub-optimal levels of fertility.

(iii) *Mating Results for the Fertility Flock Challenge Management.*—The initial mating results for this flock have illustrated the extremely high levels of fertility of which unselected Merino ewes are capable—when mating in good condition, at the right time of the year. In 1960, approximately 150 per cent. of lambs were carried to full term.

There is an obvious challenge to evolve methods of management which will reduce the high levels of neo-natal loss encountered with highly-fertile ewes, lambing without supervision.

(iv) *Growth of Corpora-lutea.*—In August-November, 1960, a group of 35 Merino ewes was detected in oestrus, inseminated, and slaughtered at 1, 2, 3, 4, 7, 8, 14 and 15 days after insemination.

The diameter changes in corpora-lutea from the present and preceding oestrus cycles were tabulated and analysed. Results showed that corpora-luteum reaches its maximum size at 7 days and begins to regress at 14 days.

The curvilinear regression for the period day 1 to day 8 (the growing period) is: $Y = 2.524 + 2.254 \times -0.144 \times 2$, and for day 14 to day 23 (the degenerative period) is $Y = 49.61 - 3.99 \times 0.088 \times 2$. (Where Y = diameter of corpus luteum in mm, and x = time in days after insemination.)

Artificial Insemination Research

(i) *Relationship between Stage of Oestrus, Vaginal Mucus and Time of Ovulation.*—The type of vaginal mucus present during insemination of ewes is strongly related with fertility.

Several groups of ewes have been observed throughout oestrus—recording changes in appearance and volume of vaginal mucus, changes in cellular components of the mucus and approximate ovulation time. The data suggest that the association between mucus and fertility is due to the mucus bearing a definite time relationship to ovulation.

This work has suggested several refinements to the artificial insemination technique. These are being tested:—

(*a*) A second insemination after 24 hours for ewes where mucus indicates early oestrus.

(*b*) Timing insemination so that most ewes are at the optimum stage of oestrus.

(*c*) Practicability of handling very large mobs of ewes by having them in flocks of 1,000, from which ewes for service are drafted at regular intervals during the morning.

(*d*) The possibility that predictive value of mucus type may enable maximal use to be made of a high-quality ram.

(ii) *Measurement of Egg Loss Following Artificial Insemination.*—In a slaughter experiment involving nine ewes per week over a twelve-month period, the loss of ova is being recorded.

The normal Trangie insemination technique is used, with a standard dose rate of approximately 100 million sperm. From each week's mating, 3 ewes are killed 48 hours after insemination, 3 at 22 days, and 3 are allowed to lamb. As well as estimating total egg loss, the special interest in this work is to relate fertilization rate to stage of oestrus at insemination.

The limited results to date suggest that failure of fertilization is the major source (45 per cent.) of egg loss at artificial insemination, with embryonic loss to 22 days (13 per cent.) as a less-important source of wastage.

BREED ESTABLISHMENT (BORDER LEICESTER x MERINO) PROJECT

This is a co-operative project between Trangie Agricultural Research Station and Condobolin Experiment Farm—at the latter.

The final mating of 400 Merino ewes to Border Leicester rams, took place in spring, 1960.

Selection of cross-bred sheep for the 1960 mating was made as follows:—*Ewes*:—The majority of culling was for horns, face cover and body type, with some emphasis on very poor wool production. *Rams*:—Selection here was based mainly on a mutton score—$\frac{\text{Body weight}}{\text{Leg Length}} \times$ Chest width; consideration was also given to wool production and type, and to a general visual appraisal of the prospective sires.

In this project, as fertility records become available, it is intended that major selection pressure be exerted on fertility.

The mating in October, 1960, failed. Over 3 days only 4 ewes from 900 exhibited oestrus. The teasers were left in with the ewes for a further 2 weeks but only 17 more ewes showed oestrus. This failure to breed was attributed to the dry winter with ewes in store condition. The ewes were well flushed prior to mating; gains of 1 lb. per day were recorded.

Breeding failures of this type are a regular feature under Condobolin conditions, so the mating has now been reorganised into a combination of spring and autumn joining. Some breeding work will thus be guaranteed and in addition, a comparison of spring and autumn joinings will be obtained.

In the long term, if the spring-mated flock survives, it will provide data on the inheritance of spring-mating ability.

FAT LAMB BREED COMPARISON TRIAL

This is a co-operative project between Trangie Agricultural Research Station and Cowra Experiment Farm—at the latter. Data obtained from it have been analysed and a draft paper has been prepared.

Over the years 1956, 57, 58, 59 and 60, Corriedale, (Border Leicester x Merino) and (Romney Marsh x Merino) ewes mated to Dorset Horn and Southdown rams have been compared for suitability for fat lamb production.

The Corriedale and the (Border Leicester x Merino) ewes proved more fertile than the Romney Marsh x Merino; (more multiple births).

Lambs from Dorset Horn rams had breater birth weights and growth rates and realised 10s. more than lambs from Southdown rams. Returns per ewe mated were 18s. more for the Dorset Horn—largely due to a false fertility difference that was induced by trucking the rams.

Lambs from (Border Leicester x Merino) and (Romney x Merino) ewes were heavier at birth, and had greater numbers reaching market than was the case for lambs from Corriedale ewes. Lambs from (Border Leicester x Merino) ewes had faster growth rates than lambs from the other two breeds. Despite the differences there was no significant difference in lamb prices; but, by reason of their higher fertility and low lamb wastage, the (Border Leicester x Merino) ewes averaged 11s. more, per ewe mated, than the other two breeds.

There was no significant difference respectively in ewe wastage and wool returns between the ewe breeds; so the (Border Leicester x Merino) ewes averaged betwen 11s. and 15s. more total return per ewe mated than the Corriedale and the (Romney Marsh x Merino) ewes.

It was concluded that the (Border Leicester x Merino) ewe mated to the Dorset Horn ram would be the best combination for lamb raising in the area.

EXTENSION WORK OF TRANGIE STATION

Major Field Day.—On 10th May, 1961, a field day on Merino sheep breeding was held at Trangie Agricultual Research Station. The day (the *Country Life* Merino Ewe Competition Field Day) was jointly organised with the Departmental Sheep and Wool Extension Service, with *Country Life* newspaper providing valuable publicity.

A large gathering of woolgrowers—1,500 to 2,000 attended. This enormous crowd was to some extent unexpected and indicated the successful advertising campaign conducted on a district basis by the Sheep and Wool officers. A pleasing feature was the attendance of many stud breeders. In this regard, the field day could well be regarded as a unique occasion.

The major aim of the displays and lectures, was to introduce a breeding plan for increased wool production—a combination of fault classing and fleece measurement. Additional points made were: (i) An association between skin wrinkle and reduced fertility; and (ii) the high potential fertility of unselected Merinos.

The audience participated keenly. General opinion was that many breeders, although perplexed by the experimental material, were impressed by the results claimed. The success of the field day in stimulating interest in fleece measurement can best be judged in due course, by increase in interest shown in the extension districts.

Wool Measurements for Graziers.—In addition to the 1,000 wool samples from Trangie sheep, 1,109 samples from outside sources have been measured for yield, staple length, etc. These comprised 300 from graziers, through District livestock officers; 84 direct from graziers, and 725 from other Departmental sources.

Circular on Field Sampling.—Because increased interest in yield measurements may be shown by ram breeders, a circular listing the field requisites for sampling has been prepared for circulation to District livestock officers in sheep and wool extension service.

Poultry Research Station, Seven Hills

GENETICS AND POULTRY BREEDING

Poultry Breeding Programme (Eggs).—This programme has entered its second selection generation. Three flocks of birds are being maintained and selected independently for egg production to 14th June of each year. Pullets selected on joint individual and family egg records are not put into the breeding pens unless the egg size and specific gravity exceeded minimum values.

New facilities, just completed, will permit this experiment to be enlarged to its planned size and to provide information on such factors as accuracy of part-production recording and periodic trapnesting.

Poultry Breeding Programme (Meat).—Two flocks are in this experiment. These differ in the origin of the birds being selected.

One flock has for some time now been selected for body weight—at six weeks of age; early signs of inbreeding may necessitate a re-designing of the breeding programme for this flock.

The second flock has been selected for only two generations. In this generation it is being examined under two separate nutritional environments, to evaluate the importance of genotype and diet in the incidence of renal damage. Incomplete analyses of the results indicate no genotype x diet interaction; suggesting the absence of genetic variation in susceptibility to the dietary faults in one of the diets.

Analysis of the bodyweight data indicates that much of the genetic variation is sex-linked. This has been confirmed both within and between generations. Additional data from the Breeding Programme (Eggs), and from sheep, rabbits and mice, have been examined and largely confirm this observation. The theoretical implications of this are being examined.

Washing of Fertile Eggs.—Washing of fertile eggs, using a commercial egg sanitising agent, has been examined. Washing has been shown not to depress hatchability but has increased mortality of the chickens in the first fourteen days after hatching from 3.9 to 7.0 per cent. Examination of other methods of washing is proposed.

POULTRY NUTRITION

Soybean Meal in Poultry Diets.—Soybean meal, the most important protein concentrate in the Americas and Europe, has become available in sufficient quantity for experimentation. Diets using soybean meal have been developed and made available to the poultry industry.

It has been found that soybean meal in chicken and laying diets has similar nutritional value to high quality meatmeals.

In chicken diets, major limiting factors are deficiency (compared to meatmeal) in calcium, available phosphorous, vitamin B12 and the amino acid glycine.

In laying diets, the major deficiency of soybean meal is sodium.

Western Division Graziers' School

This " Sheep and Pastures " school (3 days) at Hillston drew 140 Western Division graziers
Thirty-five short-term schools (a few consecutive days) and courses (one night per week for 6 weeks) were conducted by the Department and associated groups this year.

Limiting Amino Acids in Poultry Diets.—Examinations (using chicken growth assays) of two typical chicken diets (one based on wheat, meatmeal and milk powder, and the other based on wheat, soybean meal and fishmeal) have indicated that the sulphur amino acids are the prime amino acids deficiency.

In the meatmeal diet, arginine and tryptophane vary in availability as judged by chicken responses. Glycine deficiency limits the use of protein in the soybean diet.

Competition between amino acid supplements has been observed. Leucine has been observed to inhibit use of methionine, to which it is structurally related. Valine also related to leucine—but with a shorter carbon chain—does not inhibit use of methionine. Although methionine is the main limiting amino acid in chicken diets, it has been found not to limit egg production in laying diets.

Antibiotics and other Substances Stimulating Chicken Growth.—Following fifteen years of use of penicillin in the brooder house, the possibility of a decline in response, due to either the development of a penicillin resistant flora of pathogens or the elimination of pencillin-suspectible growth-depressing organisms, has been investigated.

It was found that: penicillin produced a highly satisfactory growth response, suggesting little if any adverse change in the flora; oleandomycin produced a smaller but significant growth increase; furazolidone, mainly active against *Salmonella* sp., produced no growth increase; 3 Nitro-hydroxy phenylarsonic acid produced a highly significant reduction in mortality, and improved both growth and feed conversion—particularly during an outbreak of monocytosis.

In a further experiment, wherein monocytosis was not a contingency, neither 3 Nitro-hydroxy phenylarsonic acid nor the related para-amino phenylarsonic acid produced any effect on growth, mortality, or feed conversion.

Salt in Laying Diets.—The need for salt supplementation of laying diets is being examined. Results indicate a need for salt, particularly in diets containing soybean meal.

Effect of salt deficiency was reduction in numbers and size of eggs; increased irritability of the birds—as measured by increased cannibalism; and a decline in the efficiency of feed conversion.

An attempt to estimate sodium requirements of laying hens will be made, using the diets developed in this experiment.

Pyridoxine Deficiency and Linseed Meal.—Investigation of factors limiting the use of linseed meal has established that many practical chicken diets contain marginal amounts of vitamin B6 (pyridoxine).

Addition of linseed meal to all diets produced consistent growth depressions; and these could be reversed by adding extra vitamin B6. It has not been possible to relate the pyridoxine responses to the calculated pyridoxine contents of the diets being used.

Pyridoxine content of feedstuffs and pyridoxine requirements of chickens are to be further investigated.

Poultry Housing

Aluminium Foil (Insulation) in Poultry Houses.—Aluminium foil to reduce heat radiated from the walls and roofs of laying houses is being investigated. Differences of up to 10°F. in radiated heat have been observed, as between insulated and control buildings with corrugated iron roofs. The effect of this on egg production is being examined. Differences in eggshell thickness have been determined.

Shannon Vale Nutrition Station—Sheep per Acre Research

The first phase of work at the Shannon Vale Nutrition Station has now been completed. It has conclusively demonstrated that the granite soils of New England can be made suitable for breeding and will, under proper managerial conditions, carry sheep throughout the year at a relatively high stocking-level.

The Shannon Vale work has shown that the carrying capacity can be increased from three-quarters of a sheep to four and a half sheep per acre. Despite extremely unfavourable seasonal conditions during 1960-61 the stocking-rate average throughout the year was 4.5 sheep per acre. Total rainfall was only 18.22 inches as against the average annual rainfall of 31.8 inches.

Although a high stocking-rate was maintained over this prolonged dry period, it was necessary to suspend the higher stocking-rate trials in which sheep were run at rates of up to 13 per acre.

The project has shown, however, that in normal seasons up to 13 wethers per acre could be run; and, at this stocking-rate, wool production at the 1960 shearing was 90 lb. per acre.

The original purpose of the Shannon Vale Nutrition Station as a demonstration of what can be done on the granite soils of this area having been completed, the Station is proposed as a research site for more detailed research on sheep nutrition.

Dairy Cattle Infertility Laboratory, Berry

INFERTILITY SURVEY

Herd Infertility.—In 69 investigated cases of reported herd infertility in dairy cattle, the following conditions were diagnosed: vibriosis 20, brucellosis 9, infertile bulls 9, non-specific abortions 3, sub-fertility 10, miscellaneous causes 3. Seven cases were undiagnosed. There was no fertility problem in eight cases.

Brucellosis Incidence.—To determine brucellosis incidence among herds in the district, milk from 251 herds supplying three factories was examined. The milk ring test and the whey agglutination test were applied to the bulk milk. Of these herds, 41 per cent. gave positive reactions, 44 per cent. were doubtful and 15 per cent. were negative for brucellosis.

The results indicated that about 40 per cent. of herds in the district contain cows that are or have been naturally infected with brucellosis.

Fertility Level in Normal Herds.—Preliminary analysis of the data collected from herds during a survey over the last two and a half years revealed the following information in respect of herds in which there was no apparent infertility problem:—The average post-partum anoestrum period was about 44 days, and approximately 75 per cent. of cows had an anoestral period of less than 60 days; about 70 per cent. of cows held to first service; approximately 94 per cent. of cows were pregnant after the first three services; approximately 4 per cent. of cows aborted between the third and ninth month of pregnancy; and about 3 per cent. of cows are culled annually for infertility.

Physiological Causes of Infertility in Individual cows.—The clinical examination of 200 cows at weekly intervals, from calving to pregnancy, revealed the following incidence of physiological abnormalities:—Approximately 40 per cent. of first post-partum ovulations, 25 per cent. of second ovulations, and 12 per cent. of subsequent ovulations occurred without signs of heat being detected by the farmer; about 2 per cent. of heats led to cystic follicles; and a further 2 per cent. led to cystic Corpora Lutea. In the cows examined there was an incidence of embryonic death within 90 days of conception in at least 10 per cent. of cases.

Pathological Causes of Infertility in Individual Cows.—The examination of 106 sets of genitalia from cows slaughtered at abattoirs revealed the following lesions:—Unilaterial bursitis 9 per cent., bilaterial bursitis 2 per cent., salpingitis 2 per cent., metritis 3 per cent., perimetritis 2 per cent., cystic Corpora Lutea 8 per cent., complete hormonal derangement 2 per cent., developmental abnormalities 1 per cent. Not all of these conditions would lead to infertility. However, 8 per cent. of the genitalia examined showed lesions which indicated that the cows would be infertile.

LABORATORY INVESTIGATIONS

Samples for Examination.—Two thousand two hundred and ninety-two samples were received at the Infertility Laboratory, compared with 1,962 in the previous year.

Milk Tests for Brucellosis Diagnosis.—It was established that, in the milk ring test, preliminary warming of the samples increased the accuracy of the test by eliminating many false positives. A comparison was made between the milk ring test and the whey agglutination test. The latter is less influenced by adult Strain 19 vaccination; and a basis was established for interpretation of the milk ring test.

Tests for Trichomonas foetus and Vibrio fetus.—The indirect haemagglutination test for *T. foetus* has been developed to a stage where it gives accurate and repeatable results with immune serum. This test was not satisfactory, however, for use with mucus samples.

It was established that the mucus agglutination test for *T. foetus* is specific and reliable as a herd test, but that the mucus agglutination test for *V. fetus* is affected by cross agglutination between the two organisms.

Pig Nutrition Research

Early Weaning Trial.—Results showed that suckers could be successfully weaned at 14 days of age. The practice is now being applied to the breeding herd as a whole and results are being tabulated for later study.

Milk and Meal Trial.—This experiment is still under way. At present it is being done on an individual pen basis. It aims to determine the most economical levels for feeding separated milk and meal, to produce premium-quality bacon pigs.

Restricted Feeding Trial using Lucerne Meal.—The purpose is to determine effect, on carcase quality, of restricting the ration of bacon pigs and of adding lucerne meal as a high fibre supplement. This trial is not finished.

Scouring in Suckers.—This condition consistently did not respond to standard therapeutic control measures. It disappeared following management changes relating to feeding of brood sows, before and after farrowing, and the use of fresher meatmeal.

Copper Supplementation of Pig Rations up to Porker Stage.—This preliminary trial is at Grafton Experiment Farm. Copper sulphate is being used as a mineral supplement to determine its effect on growth rates. The trial is still proceeding.

Individual Weighing of Brood Sows.—All brood sows are weighed individually once a week, to study feed utilisation in terms of body size, prolificacy and fecundity.

Regulatory Services

CATTLE COMPENSATION ACT

Fewer Claims, Payments Higher.—Six thousand one hundred and forty-eight claims were dealt with. They involved 11,240 animals. Compensation payments amounted to £190,797.

Compared with the previous year's figures, claims (by 629) and animals concerned (by 88) were fewer; but there was an increase of £1,332 in compensation payments. The higher level of compensation payments reflected the generally prevailing increased market value of cattle.

The Diseases Concerned.—Diseases for which compensation was paid were as follow: tuberculosis (6,596 head), cancer (2,443), actinomycosis (1,739), actinobacillosis (383), *Pleuroneumonia contagiosa* (9), trichomoniasis (11), and Johne's Disease (59); total, 11,240 head.

The Refused or Reduced Claims.—Payment was refused in the case of 134 claims, as follow: for delayed notification of disease by owners (114 claims), failure of owners to notify (8), failure to pay Compensation Levy (7), and for delayed application for compensation (5); total, 134 claims.

In addition, payment was reduced on 42 claims where application for compensation was not made within 60 days of slaughter.

Continued Increase of Fund.—In each of the past four years there has been an increase in the balance of the Cattle Compensation Fund. The position of the fund at the end of each year has been as follows:—

	£	s.	d.
Balance at 30th June, 1958	62,998	8	8
Balance at 30th June, 1959	109,599	0	10
Balance at 30th June, 1960	237,873	2	8
Balance at 30th June, 1961	376,209	9	8

The balance at the end of 1960-61 is the greatest since the fund came into existence.

SWINE COMPENSATION ACT

Fund Effect of Swine Fever Outbreak.—The credit balance of the fund at the outbreak of swine fever was about £95,000. Because it is likely that the fund will be depleted before the outbreak has been finally controlled, steps have been taken towards an increase from 6d. to 2s. per carcase in the rate of Swine Tax.

Branding Check System Introduced.—To impress pig-raisers with their responsibilities under the Swine Branding Act, 1940, a system of checking on branding was instituted throughout the State. It had excellent results.

STOCK FOODS AND MEDICINES ACT

Limitation of Urea in Stock Foods or Licks.—The regulations under this Act have been amended, to declare urea a foreign ingredient of any stock food or lick and to limit the amount of urea in any preparation to 3 per cent of the total weight.

Registrations of Stock Foods and Licks.—Registration was granted to 1,358 stock foods and licks; 152 more than in 1959-60. The registration applications were made by 212 wholesale dealers; four more than in 1959-60.

Registration of Medicines.—Registration was granted by the Stock Medicines Board to 1,756 stock medicines. Two products were refused registration.

COMMONWEALTH QUARANTINE ACT

Increased Inspectors.—Work associated with administration of the Commonwealth Quarantine Act, 1908-60, continued to increase. It was necessary to appoint a third Port Inspector. The main increases arose from greater air travel and the volume of overseas material arriving through Sydney Parcels Post Office.

Liaison with Customs and Excise Officers, etc.—Good liaison and co-operation between the Animal Quarantine Service and the Department of Customs and Excise continued. A senior officer of the Animal Quarantine Service addressed Customs Trainee Schools periodically, to explain the significance of the service and to lay the basis of co-operation. Liaison with the various customs agents and the shipping companies through their respective associations was also maintained.

Increased Animal Imports.—The number of animals imported increased. Main increases were dogs, cats and horses imported from New Zealand and United Kingdom, and Queen Bees from Germany and U.S.A. Horses from United Kingdom increased fivefold.

Because of foot and mouth disease in the United Kingdom, special precautions were taken with the horses to prevent possible mechanical conveyance of the virus. Horses do not naturally contract the disease but may carry the virus mechanically.

Attempted Smuggling.—Smuggling of birds again received attention. One case was detected by a Customs and Excise officer. The person involved had eighty-five red-throated parrot finches. They were in six small mosquito-netting bags, inside his trousers and coat.

Certain vessels were kept under surveillance on arrival in Sydney, but although smuggling was suspected no definite evidence was obtained.

Increased Animal Products Imports.—This aspect again required the constant attention by the Animal Quarantine Service. Importation of tinned meat products rose appreciably. Those from U.S.A. and Canada, respectively showed a 33-fold and 250-fold increase, compared to 1959-60. There were also increased consignments of cheese from Denmark, Holland, Greece and Italy; meat and liver meals from New Zealand; and fish meal from South Africa.

Increased imports of hides and skins apparently resulted from the shortage and high prices of local hides. Argentine exported 11,188 packages of hides to this State, as against none last year. Importations from New Zealand increased ten-fold. There were smaller increases from European countries, France, Germany, Italy and Denmark. All of the hides except those from New Zealand were tanned immediately on landing, at tanneries approved under the Quarantine Act.

Passengers' Luggage.—All ships from overseas were met. Officers of the Animal Quarantine Service co-operated with Customs Officers to search baggage for illegal importations of certain articles such as salami, other meat products, cheese and certain eastern foods. Increased attention was given to air arrivals.

Overseas Parcels Post.—Considerable quantities of prohibited goods were seized. The volume of goods subject to quarantine control arriving from overseas by parcels post was heavier than in 1959-60. The migration programme and the lifting of import restrictions probably had a bearing; more parcels came for migrants and more trade parcels came for intending importers. There was difficulty particularly at the Christmas period, in clearing such goods.

Ships' Pets.—Strict supervision over ships' pets on overseas vessels continued. An increase in the number of vessels arriving at Sydney increased this supervisory work.

Meat Inspection Service

INSPECTION OF MEAT AT TIME OF SLAUGHTER

Number, Range and Distribution of Places Inspected.—Inspection of meat at the time of slaughter was done by Department of Agriculture meat inspectors at the State Abattoir and at seven other licensed slaughtering premises within the Metropolitan Abattoir Area (County of Cumberland); also at twenty licensed slaughtering premises outside the metropolitan area—including one abattoir at Yanco where meat inspection was taken over from the Leeton Council during the year.

The Department's Meat Inspection Service also controlled inspection of meat slaughtered (for metropolitan consumption) in another ten slaughtering establishments outside the metropolitan area. Inspection at these was by Council-employed meat inspectors approved by the Minister for purposes of Section 21A, Meat Industry Act.

About 20 per cent. less bovine cattle were slaughtered and inspected in all abattoirs, compared with 1959-60, with a tendency to increase in the last six months.

Slaughtering of calves was at much the same level as in 1959-60, but pig slaughtering increased by 16.5 per cent.

Slaughtering of sheep increased by about 1.27 millions (about 21 per cent.).

The increased slaughtering raised the need to increase the number of meat inspectors.

Knackeries.—Two meat inspectors daily at two knackeries in County of Cumberland inspected horse meat at the time of slaughter for pets food and supervised the methyl violet spraying of carcases. Totals of 16,754 horses and four cattle were slaughtered there.

Butchers' Shops.—Butchers' shops were visited, to police the provisions of the Meat Industry Act—particularly in regard to illegal sale of unbranded meat and lamb. In all, 1,417 shops were visited. There was no prosecution.

Re-inspection of Meat Introduced into the Metropolitan Abattoir Area.—Movement of meat into the Metropolitan Abattoir was controlled and the meat re-inspected. Special attention was given to interstate and New Zealand meat. This was also re-branded, as required under the Meat Industry Act.

Effect of Swine Fever Quarantine.—Since the proclamation (May, 1961), of a Swine Fever Quarantine Area (including the Sydney, Newcastle and Maitland areas) the Meat Inspection Service has played a big part in control of movement of pig meats and products containing pig meats out of the quarantine area. The meats and premises have been inspected for the issue of movement permits.

Condemnation of Meat.—All meat found on inspection to be unfit for human consumption was condemned and destroyed.

Tabulated Results of Stock and Meats Inspected.—The total of stock inspected by the State meat inspectors at time of slaughter, the conditions for which carcases and portions of carcases were condemned as unfit for human consumption, are set out in the following tabulations:—

Totals of Stock Inspected

Place of Slaughter	Type of Stock			
	Cattle	Calves	Pigs	Sheep
State Abattoir	120,697	76,401	103,673	3,096,101
Licensed works in Metropolitan Area	37,645	9,755	19,517	1,402,456
Licensed works outside Metropolitan Area	255,120	290,147	355,710	2,482,913
Totals	413,462	376,303	478,900	6,981,470

Total Condemnation on Post Mortem Inspection

Condition	Cattle		Calves		Pigs		Sheep	
	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill
Actino	7	·002	..	..	..	..	..	..
Arthritis	36	·009	65	·017	878	·183	2,523	·036
C.L.A.	..	..	..	..	..	..	2,192	·031
Cysticercus Ovis	..	..	..	..	..	..	222	·003
Emaciation	590	·143	53	·014	26	·006	18,982	·272
Sarcosporidiosis	1	..	..	..	..	..	495	·007
Septic Conditions	238	·057	127	·034	2,524	·527	669	·010
T.B.	2,183	·528	54	·014	575	·120	..	..
Other Conditions	692	·167	748	·199	662	·138	5,703	·082
Total	3,747	·906	1,047	·278	4,665	·974	30,786	·441

Partial Condemnations

Condition	Cattle		Calves		Pigs		Sheep	
	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill	No.	Per cent. of kill
Actino	7,917	1·915	7	·002	..	..	..	..
Arthritis	911	·220	41	.011	3,168	·662	7,529	·108
C.L.A.	..	..	..	..	..	..	16,650	·239
Septic Conditions	129	·031	10	·003	821	·171	382	·005
T.B.	2,871	·695	13	·003	2,308	·482	..	..
Other Conditions	3,106	·751	67	·018	13,036	2·722	7,077	·010
Total	14,934	3·612	138	·037	19,333	4·037	31,638	·362

Meat Introduced into the Metropolitan Abattoir Area From 30 Different Centres within N.S.W.

Class of Meat	Carcases	Piece Meats (lb.)
Beef	300,331	1,933,936
Veal	268,572	165,163
Pork	281,820	429,178
Mutton and Lamb	2,120,641	3,362,020
Goat	10,708	14,760
Bacon	4,537 sides	1,951,649
Sundries	....	8,551,616

From Other States and New Zealand are as follows

Class of Meat	Carcases	Piece Meats (lb.)
Beef	113,079	4,424,335
Veal	79,080	290,368
Pork	75,368	5,341,209
Mutton and Lamb	458	839,578
Bacon	2,777	3,865,132
Sundries	....	1,455,780

Of Meat Condemned On Re-inspection

Beef	Veal	Pork and Bacon	Mutton and Lamb	Sundries
2 carcases 2 quarters 2 rumps and loins 7 buts 1 set of ribs 700 lb. boneless beef 30 dozen brains	3 carcases 7 quarters 260 lb. boneless veal	3 carcases 42 legs 35 hams 14 shoulders 17 middles 1 flitch	542 carcases 24 forequarters 25 legs 3 saddles 810 lb. boneless mutton 5,761 livers 650 kidneys 240 lb. tongues	5,492 lb. smallgoods 39,399 rabbits

Offal Condemned.—It is not practicable to keep records of offal condemned at the time of slaughter in busy works; but periodical sampling surveys were made, for statistical records purposes, of the condition for which livers were condemned. The results were as follows:—

Sheep Liver Condemnations (48,000 *in samples*)

		Approximate percentage of whole:
Number condemned	12,034	25
Condemnation Reasons—		
Liver Fluke	4,407	9.2
Hydatid Cysts	2,552	5.3
Cystercercus Tenuicollis ..	2,372	5.0
Casseous Lymphadenitis ..	798	1.7
Cirrhosis	143	0.3
Other parasitic conditions	1,581	3.0
Melanosis	221	0.5

Cattle Liver Condemnations (24,800 *in samples*)

		Per cent.
Number condemned	6,271	25
Condemnation Reasons—		
Liver Fluke	4,480	18
Hydatid Cysts	665	2.7
Telangiectasis	444	1.8
Abscesses	417	1.7
Adhesions, etc.	222	0.9
Other conditions	43	0.17

Sheep Intestines.—A sampling of 48,000 sheep intestines showed that 10,427 (21.7 per cent.) were affected with Oesophagostomiasis (nodule worm) and were useless for sausage casings.

Ante Mortem Inspection of Cattle.—Inspections of all cattle offered for sale at Flemington Saleyards and of all cattle admitted to the State Abattoir lairages were regularly made. All suspects, either sent from the country on order for movement for slaughter or found during ante mortem inspection, and all cattle forwarded for slaughter as reactors to the tuberculin test were registered. The total of suspects registered at Flemington and Homebush Bay was 1,119. The conditions found on post mortem examination were as follows: tuberculosis, 15; actinomycosis, 283; actinobacillosis, 284; cancer, 268; injury, 67; abscess, 103; other conditions, 84; no visible lesions, 15.

Eighteen suspects were totally condemned; 10 of these were for tuberculosis, five for cancer and two for other conditions.

The total of T.B. reactors registered at Flemington Saleyards was 1,488. Only three T.B. reactor cattle were received direct at Homebush Bay.

Board of Tick Control

CONTINUATION OF ERADICATION IN AREAS WEST OF THE RICHMOND RANGE

Rivertree Quarantine Area Divided.—Eradication measures were continued. On representations from stockowners, the Area was divided into two sections by a Rivertree Quarantine Line. It mainly followed the existing stockowners' boundary fences and roughly divided the Area into a North-western and a South-eastern Section. The reason was that it might be possible to release the North-western Section after a further period of examinations. There had been little stock movement between the two areas.

The Quarantine Line was established in November, 1960. By this time fences had been strengthened and new sections erected where needed. The line was patrolled on a five-day basis.

Both sections of Rivertree were placed under a policy of 21-day examinations from 1st January, 1961, to 31st May, 1961.

Release of North-western Rivertree Area.—No evidence of cattle tick was found in North-west Rivertree. The Board of Tick Control has recommended that the Section be released from quarantine.

Quarantine Retained in South-eastern Rivertree Area.—Unfortunately, in the South-east Section, examinations in April revealed a multiple infestation at Paddy's Flat on a small reserve, and in May a single tick infestation was detected on a second holding—about a mile further south, adjacent to the Tabulam Quarantine Area. This Section has to remain under quarantine.

EXAMINATION IN GRAFTON QUARANTINE AREA

Special Areas of Clarenza and Lower Southgate.—The policy of examination of all moving stock and the treatment of stock moving from these areas was maintained.

Status of the Whole Grafton Quarantine Area.—A policy of 21-day examinations was commenced in October, 1960, and continued until 30th June, 1961, to determine the status of the Area as a whole.

In all, 890,752 head of stock were examined. All specimens of ticks collected in these examinations were checked at Lismore.

Unfortunately, in March, 1961, three infestations were detected in the vicinity of Tabbimoble Creek and Mororo; and in April a further infestation was detected on Goodwood Island. In each case multiple infestations were present. It was not possible to determine the origin nor how long the infestations had been on the properties.

Detection of infestations in the North-eastern portion of the Grafton Area will necessitate the whole of the Grafton Area remaining in quarantine for a further period, while further steps have to be taken in respect of the infested portion.

Two New Special Areas Created.—To protect the remainder of the Grafton Area, two Special Areas were created. These include the infested country, and holdings on to which cattle had moved from the infested holdings. The Special Areas comprise all that portion of the Grafton Quarantine Area north of the Clarence River and east of the Old Mangrove Creek Line, together with the Islands of Chatsworth, Harwood, Goodwood and Warragai. Stock could only move from these areas subject to three treatments, the last two of which were to be clean treatments, at the prescribed intervals.

No further infestation was detected, and there was no evidence of any infestation in the Special Areas of Clarenza or Lower Southgate.

COMBATING ARSENIC RESISTANT TICKS

During July and August, 1960, no additional holdings were involved with arsenic resistant ticks. In September, advice was received that all remaining arsenic dips were to be charged with DDT. This has eliminated any further problem associated with arsenic-resistant tick infestation. All restrictions on movement of stock from such holdings have been removed.

TICK FEVER

No outbreak of tick fever occurred. Still in quarantine at the end of June, 1961, were three holdings in Tweed Area, four in Casino Area, three in Nimbin Area, and two in Bangalow Area.

C.S.I.R.O. officers at Yeerongpilly have developed a Compliment Fixation Test for detection of infected animals. It has not been applied in the Tick Quarantine Areas as yet, owing to technical difficulties. The test may be available for general use in the coming year. If so, it should be possible to modify the control measures within the Tick Quarantine Areas.

ALTERATIONS IN POLICIES EAST AND WEST OF THE RICHMOND RANGE

Richmond, Tweed and Kyogle Quarantine Areas.—Since all dips in the Richmond and Tweed Areas were to be charged with DDT, staff in these areas were fully engaged in the conversion during October, November and December, 1960. Therefore, it was not possible to proceed with control policy until January, 1961. Then a modified control policy similar to that of 1959-60 was put into operation and maintained until 30th June, 1961.

Staff maintained the dips and, as far as possible, supervised the treatments of all dry stock at 28-day intervals. Dairy herds were inspected where possible and the necessary supervision was given to the treatments of infested cattle and the control of tick-fever holdings.

A considerable proportion of the stock in these areas was treated during the policy period. The percentage was higher than in 1959-60, mainly because the dips had been converted from arsenic to DDT. The following table indicates the increase in treated stock:—

	Jan.	Feb.	March	April	May	June
1960	244,134	255,457	296,044	265,167	278,078	104,256
1961	301,287	301,016	335,326	276,552	317,147	166,748

The number of infestations detected was considerably less, probably due to greater use of the dips by the stockowners and to the very dry spring of 1960.

The following table shows the position over the last three years:—

Area	Infestations Recorded		
	1958-59	1959-60	1960-61
Bangalow	167	78	30
Kyogle	133	19	11
Lismore	150	65	31
Nimbin	182	62	26
Tweed	194	69	28
Casino	169	111	33

Areas West of the Richmond Range.—A full control policy operated in Woodenbong, Bonalbo, Tabulam and Copmanhurst Areas from 1st January, 1961, to 31st May, 1961. In this period all stock were treated five times at intervals of 28 days, with the exception of dairy herds, and a few beef herds too far from any dip. In those cases the stock were examined at yards provided by the owners.

All moving stock were examined and dipped prior to movement, with the exception of stock proceeding to saleyards (the latter were examined prior to movement and treated after the sales) or stock proceeding east of the Richmond Range (these were allowed to move on a clean examination). The number of infestations detected in these areas was very limited, as shown by the following table:—

Area	Infestations Recorded		
	1958–59	1959–60	1960–61
Bonalbo	4	5	1
Tabulam	2	9	1
Woodenbong	10	2	4
Rivertree	7	..	2
Copmanhurst	7	1	..

Examination of Stock at Macksville and Tenterfield Abattoirs

An assistant was retained respectively at the Macksville and the Tenterfield Abattoirs, to examine all stock slaughtered. The Tenterfield assistant also supervised the unloading of cattle arriving from Wallangarra by train, and the dipping of all calves prior to slaughter. No tick specimen was detected at Tenterfield, but many specimens were collected by the Macksville assistant. All were checked by the Lismore office, and identified as Haemaphysalis or Ixodes species. No evidence of cattle tick was found.

Compensation Claims

Claims for compensation for the loss of ninety-one head of stock by death or injury were paid. The total involved was £1,885 14s. 11d.

Fencing

The quarantine boundaries were maintained and improved. This work was spread over the Tweed, Woodenbong, Tabulam, Copmanhurst, Lismore, Bonalbo and Grafton areas. In all, 17½ miles of new fencing was erected and 59 miles of fencing was intensively repaired. Also, 3½ miles of fencing was erected on the boundaries of the Cattle Tick Research Station at Wollongbar.

Dip Construction

The Dip Maintenance Gang constructed five new dips in the Tweed Area for the control policy, and one in the Bonalbo Area to serve an area opened up for grazing. Dip yards in the Grafton Area are under repair following detection of ticks in the vicinity of Mororo.

In all, the Field Staff and Dip Gang repaired 353 dips, and gravelled 53 dip yards.

Staff

The Board commenced the financial year with a field staff of 567 (as against 730 at the outset of 1959-60). By the end of 1960-61 the 567 had been reduced to 528. Late in the twelve months, when it was apparent that finances would permit, eighteen men were engaged for essential fencing on the Tick Quarantine boundaries. Their services were terminated on 30th June, 1961. The work they were engaged in could then be completed in the winter by the Board's regular staff.

Cattle Tick Research Station Site

Purchase of the 385 acres property at Wollongbar was completed early in January, 1961, and possession ensued in February.

Considerable preliminary work has been done; comprsing erection of fencing, construction of roads, culverts over creek crossings, and modifications of existing dairy buildings for use as storerooms.

Investigations—Laboratory of Tick Board

Laboratory additions were completed early in the year. Laboratory staff then completed all fittings; so the new section came into operation early in 1961.

Various factors precluded extensive investigations, but the following matters received attention:—

No Depletion of Gamma Isomer of BHC.—Further experience with approximately fifty-five DDT-BHC dips (most have been in operation for over three years) has confirmed previous observations—no evidence of gamma isomer depletion.

Accordingly, routine analysis of the samples from such dips has been by use of a chromatographic column for separation and determination of DDT and gamma isomer of BHC. The total isomers have been calculated from the gamma isomers figure; with occasional checks of total isomers by other methods.

Care and Maintenance of DDT Dips.—Further experience with Rucide (DDT) has confirmed the fact that prolonged heating, even at temperatures below melting point, can spoil Rucide.

Toxicology of DDT and BHC.—Further specimens in connection with mortalities said to have been caused by DDT-BHC dip treatments have been analysed Presence of both DDT and BHC in varying amounts has been shown. Unfortunately, no information is yet available as regards critical level of DDT and BHC in various organs. So, it is not possible to determine whether deaths have in fact been due to the treatments.

Queensland Border Control

Stanthorpe Section

Stock Crossings.—Stock traffic to New South Wales was again light, both in re-stocker and local Abattoir movements. Stock movements from New South Wales to Queensland were light also, except for fat sheep and lambs. Other stock moving across comprised mainly herd bulls and flock rams in the annual move to Queensland stations.

From Queensland to New South Wales the movements were: cattle 169,730 head, sheep 12,002, pigs 41,619 and horses 2,988.

From New South Wales to Queensland the movements were: cattle 3,251 head, sheep 166,700, pigs 426, and horses 532.

Total revenue collected in dipping fees was £5,375.

Fencing.—The border fence from Bald Rock to Wallangarra was renewed on a re-surveyed line. This provides a better boundary. New fencing in this area totalled 13 miles 54 chains.

One mile of new fencing was completed in the Donnybrook-Limestone Section, west of Wallangarra. In the Cottonvale-Thulimbah and The Summit areas some 6 miles of new and repaired fencing was done by land owners, to Departmental requirements. This is a buffer and stockproof area around a block of orchards situated alongside the border fence. In the Acacia Plateau Section approximately 2 miles of fencing was renewed.

Dips.—All dips and dip-yards were maintained in good condition.

Buildings.—Necessary maintenance and repairs were done at the Riverton, Sugarloaf, Thulimbah, Cullendore, Killarney Nos. 1, 2 and 3, and Lower Acacia Creek cottages; and at the Wallangarra (Main), Killarney and Stanthorpe Gate offices.

Goondiwindi Section

Stock Movements.—There was a marked upward trend in the total of cattle, sheep and horses from Queensland, compared with 1959-60, although the number of fat cattle declined. No P.P.C. incidence in cattle from Queensland was known.

From Queensland to New South Wales the stock movements were: cattle 161,793 head, sheep 412,080, pigs 123, and horses 4,863.

From New South Wales to Queensland the movements were cattle 34,212, sheep 292,652, pigs 136, and horses 40.

Total revenue collected in dipping fees was £1,596.

Fencing.—Parts of the border fence were renewed by landholders. Extensive repairs have also been done.

A weir was completed at Boronga Crossing by the Irrigation and Water Supply Commission at the end of 1960. Boronga Crossing cannot now be used for crossing stock, as the roads and routes on the Queensland side of the border have been closed.

Land leased from the Queensland Department of Lands at Boonanga Crossing by the New South Wales Department of Agriculture has been enclosed by a new barbed wire fence.

Dips.—All dips and yards are in good repair.

Buildings.—All cottages except the Mungindi are in good repair. Mungindi cottage faces replacement.

Mungindi to Hungerford Section

Trend towards Motor Transport.—This trend of stock movements continued, to such an extent that gazettal of two new crossing places has been considered.

From Queensland to New South Wales the stock movements were: cattle 30,306 head, and other stock 191,510.

From New South Wales to Queensland they were: cattle 3,473, and other stock 15,147.

West of Hungerford Section

Border crossings in this section are controlled by the Ranger for the Milparinka Pastures Protection District. He has been appointed as a part-time Border Crossing Inspector.

For the first time in several years there were stock movements from New South Wales to Queensland through the Milparinka district; 29 cattle and 2,920 sheep crossed into Queensland.

Consignments of Queensland cattle to New South Wales were relatively heavy. Most were en route to the Adelaide market; 5,511 cattle and 198 horses crossed from Queensland to New South Wales in this section.

The Livestock Husbandry and Advisory Officer Branches of Division of Animal Industry

These Branches, each controlled by a Principal Livestock Officer (categorised), are the Beef Cattle, Horses and Goats Branch, Sheep and Wool Branch, Pig Branch, Poultry Branch, and Apiculture Branch.

They provide the District livestock officers (categorised) for extension service, and Experiment Farm/Station/Research Station livestock officers for husbandry of Departmental studs, herds, flocks.

Sheep and Wool Branch

Extension Work

Now Eighteen Field Officer Districts.—The Branch now provides a Sheep and Wool field officer advisory service in eighteen districts. All District positions have been occupied from January, 1961.

Field Investigation Projects System.—District sheep and wool officers have this year commenced a system of field investigation projects in association with the research staff of Trangie Agricultural Research Station.

The projects are designed to confirm research results under commercial conditions and to serve as demonstration units. Two such projects, undertaken at Havilah and Lue Stations, Mudgee, are to study face cover and wrinkle in relation to fertility.

This project system will be developed throughout the State in the ensuing year.

Emphasis on Fleece-weighing as Selection Aid.—The value of greasy fleece weighing as an aid to the selection of Merino sheep is being actively pressed into the flock industry by field officers. A set of scales and necessary ear tags have been supplied to each District sheep and wool officer.

Major Field Day, Trangie.—In collaboration with the staff of Trangie Agricultural Research Station, a special Sheep Field Day was organised on a State-wide basis. This proved to be very successful. The attendance was estimated to be over 2,000 people. (There is more detailed reference to this in the report of Trangie Station.)

Merino Ewe Competition.—This has been developed into an excellent medium for group extension. Field days are held at the district level of judging, and field days with special speakers are run in conjunction with the State Final judging. The Competition effects are reflected in the flocks of the competitors.

Lamb Breeder Ewe Competition.—Over recent years this has declined in popularity, and will be reviewed when this year's Competition ends.

Locality Competitions.—District livestock officers (sheep and wool) conducted a number of local Merino Ewe Competitions, Hogget Competitions and Lamb and Carcase Competitions in the course of their extension programmes.

Junior Farmer Clubs.—Help was given to the Junior Farmer Movement (within the Department of Education system) by judging of projects, lectures and demonstrations.

Science Sheep Show Displays.—This Department co-operated fully with Universities, C.S.I.R.O., Wool Bureau and other organisations in the N.S.W. Stud Sheep Breeder Association's Science Sheep Show.

District livestock officers (sheep and wool) also assisted with wool week displays at country centres.

Inter-year Comparison of the Major Extension Activities.—Reference to the following table indicates an overall increase in group extension work:—

	1959–60	1960–61	Percentage Increase or Decrease
Number of properties visited	2,463	2,460	..
Number of sheep classed	280,477	351,338	+ 25.2
Value of sheep selected and purchased	£76,156	£70,365	— 6.5
Lectures, demonstrations and field days	259	367	+ 41.7
Ram sales, Agricultural Shows, etc. ..	167	175	+ 4.4
Radio broadcasts, publicity statements	329	536	+ 62.9
Competitions serviced	30	36	+ 20.0
Field Investigation projects	..	3	..

The staff position regarding Districts has been more stable than for many years. Should this persist, a steady rise in work output is assured. An officer appointed to a District requires three to four years in that particular District to become fully effective. Good public relations are most important for extension workers, and these are built by increasing personal contacts and mutual respect.

Production Trends Noted by Extension Workers

Spring Lambing Trend.—A general trend towards spring lambing is still occurring. The advantage of this change in time of lambing is gradually being accepted by breeders as a means to increase lambing-percentage rates.

Two Lambing Groups per Flock.—In the lamb-raising industry it is becoming general practice to divide the flock into a spring lambing and autumn lambing group. By this method the producer is able to take full advantage of seasonal and market conditions.

Autumn Shearing.—Autumn shearing to fit in with spring lambing has been introduced into some flocks. This practice is not expected to become extensive other than in the tableland areas; and will be mainly in cross bred flocks.

Increased Interest in Fleece-weighing.—Enquiries have increased for information and assistance on the selection of Merino Flock sheep by greasy fleece weight. This method as an aid in selection of flock sheep will increase within the next few years.

In-service Training

Refresher School, Leeton.—The Annual Refresher School for Sheep and Wool Officers was held in May, 1961, at Yanco Agricultural Research Station. This School dealt with the lamb-raising industry. The results of research work were presented and work in progress was discussed. A visit was made to Leeton Experiment Farm where a comprehensive range of projects is established.

Extension Methods School.—Five sheep and wool officers attended the Departmental Extension Service and Methods School at Newport, conducted by Division of Information Services.

Preliminary "District Training".—Six junior sheep and wool officers undertook in-service training with District officers; and at Fowler's Gap Station, Broken Hill, and Shannon Vale Nutrition Station, Glen Innes.

In-service Training Interstate.—The three District sheep and wool officers in Western Division undertook in-service training by attending field days held at Merino studs in South Australia.

Sheep at Departmental Institutions

Condobolin Experiment Farm Projects.—There are 2,192 sheep here. Drought conditions in the spring and early summer forced transfer of the young ewes in the Border Leicester-Merino fixation trial at Cowra Experiment Farm. After classing and shearing, some 300 of them will be returned to Condobolin. The current sheep projects at Condobolin are:—

(1) Fixation of the Border Leicester x Merino: This will be the last season of the Merino ewes. They are now six years old or over. After the present lambs are weaned these ewes will be sold.

Mating of the F_1 and F_2 generation ewes will be carried out by dividing each group into two, one group to be mated in the spring and one in the autumn. This will provide further studies in the time of mating of this cross and the suitability of the Condobolin environment for spring lambing.

(2) Drought Feeding Recovery: This trial was concluded. Results are now being prepared for publication.

Cowra Experiment Farm Projects.—There are 2,633 sheep here. The projects comprise:—

(1) A Breed Comparison Study (Fat lamb production): Comprising Border Leicester x Merino, Romney Marsh x Merino and Corriedale ewes mated to Dorset Horn and Southdown Rams. (See the Trangie Agricultural Research Station section of this report for more detail.)

(2) Time of Lambing Trial: Three groups, mated in (*a*) autumn, (*b*) spring, (*c*) autumn and spring.

(3) Early Weaning.

(4) Rate of Stocking: Four rates of stocking per acre (*a*) one sheep, (*b*) two sheep, (*c*) three sheep, (*d*) four sheep.

Anticipating completion of the Breed Comparison Trials, a flock of pure-bred Border Leicester ewes is being built up, to be used in conjunction with pure-bred Merinos in a Hybrid Vigour Trial. This work will be controlled by research staff at Trangie Agricultural Research Station.

Grafton Experiment Farm Coastal Lamb-raising Project.—There are only 80 sheep here for experiments on lamb production in coastal areas. The work will end shortly. It has shown that lamb production in this area is uneconomical —because of managerial, nutritional and internal parasite problems.

Fat-lamb Breeder Research

Leeton Experiment Farm is a centre of fat-lamb breeding and husbandry experiments, including :—seasonal variations in reproduction of Border Leicester x Merino ewes ; fertility comparisons of this cross and Merino ewes ; mating behaviour of ewes after lambing ; effect of body condition at start of breeding season ; effect of premature shearing on twinning rate ; subsequent fertility of ewes implanted with hexoestrol as lambs ; and others.

In this photo: first cross Border Leicester x Merino ewes with Dorest Horn sired lambs at foot.

Leeton Experiment Farm Projects.—There are 2,891 sheep here. The projects comprise:—

1. Seasonal variations and reproduction of Border Leicester x Merino ewes.
2. Production per acre experiment.
3. Effect of nutrition and shearing on reproduction of Border Leicester x Merino ewes.
4. Comparison of Merino ewes and Border Leicester x Merino ewes as dams for fat-lamb production.

New England Agricultural Research Station Lamb-sire Comparison.—The present sheep number 937. The district was declared a drought area in April.

A new project to compare the Cheviot ram with the Dorset Horn ram for lamb production has been commenced.

Shannon Vale Nutrition Station.—The present sheep number 2,657. The High Stocking Rate Trials were discontinued. (See earlier section of this Report, under Research, for more detail of the Shannon Vale work.) A 16-mm. cine film dealing with the Shannon Vale story has been completed. Prints of the film will be available for extension service in the near future.

Trangie Agricultural Research Station.—The present sheep number 5,936. (See an earlier, major section of this Report for details of the comprehensive research range at Trangie.)

Temora Experiment Farm Projects.—The sheep here total 1,840. The projects are:—

1. The Corriedale-Polwarth Breed Comparison Trial.
2. The Poll Dorset Stud: Demand for Stud Poll Dorsets declined. This was reported by all breeders. Some enquiries for stock from Temora have been received recently. Ten stud rams are available for sale, also 20 young ewes. The flock rams from this project are now being used for lamb-raising work at Leeton Experiment Farm.
3. The Maintenance Feeding Trial using Corriedale-Polwarth and Border Leicester-Merino wethers, proceeding concurrently at Temora and in the Burdekin Unit at Glenfield Veterinary Research Station. This trial is complete, and results are being prepared for publication.

   A new project, ad-lib feeding to establish relative efficiencies of breeds' conversion of feed, is to be commenced. Corriedale-Polwarth and Merino wethers will be used.

Tamworth Agricultural Research Station Projects.—The Station has 300 sheep at present.

A study of the influence of the Poll gene on growth of lambs was commenced this year. Lamb-marking techniques are also being studied.

Yanco Agricultural Research Station.—Here there are 1,420 sheep. On completion of the present Breed Comparison Trial and Nutrition Trial, this Station will be used to breed Border Leicester-Merino ewes. A flock of 800 Merino ewes has been established at Yanco, and mated to Border Leicester rams.

The Breed Comparison Trial will end in the ensuing year.

Wollongbar Experiment Farm.—Here there are only 30 sheep. They are used in silage-digestability studies.

BEEF CATTLE, HORSES AND GOATS BRANCH

Beef Cattle

Extension Activities.—These have been appreciably expanded by the appointment of two additional officers to the Lismore and Gunnedah Regional headquarters. The section now has three such officers in the field.

Two well-attended schools were conducted for farmers; a four-days school at Yanco Agricultural Research Station (40 students), and a five-days school at Gunnedah (72 students).

The ninth annual Beef Cattle Breeders' Competition was conducted. There were 212 entries, indicating sustained interest and support. This competition has been a most valuable medium, and has also added to the knowledge, experience and public relations of Livestock Officers of this Branch who officiate as judges.

Investigational Work.—The main centre of beef cattle investigations is at Leeton Experiment Farm. The work in progress there includes:—

Production per acre experiment.

Early weaning of calves.

Effect of hexoestrol on growing calves.

Relative values of long hay, milled hay, silage and chopped green pasture for growing cattle.

Hay supplementation of lush pastures.

Observations of hair shedding and teething in relation to growth.

The "Improvement of Cattle" Project (No. 108 under the Agricultural Extension Grant) is now being carried out on properties in the Bombala, Canowindra, Newbridge and Woodstock districts.

Investigations into the economics of vealer production on dairy farms are about to be completed at Grafton Experiment Farm and Wollongbar Agricultural Research Station.

Beef Cattle Studs.—Total numbers in the Department's beef studs have increased slightly, to 488, compared with 412 at the end of 1959-60.

Highlights of activities have been:—

(*a*) selection methods based on rate of gain; these play an equal part with qualities of conformation;

(*b*) exchange of Angus bulls between the Trangie stud and the Wambanumba stud owned by R. R. Tout Pty. Ltd., Wambanumba, Young;

(*c*) purchase of a young Poll Shorthorn bull, "Progorong Icicle", for 1,200 guineas at the 1961 Sydney Royal Show.

Stud Angus cattle are maintained at Wollongbar Agricultural Research Station, Leeton Agricultural Research Station and Trangie Agricultural Research Station. The Wollongbar and Leeton studs are used exclusively for investigational purposes. A herd of Angus cattle is also maintained at Tamworth Agricultural Research Station.

The Department supplied an Angus and a Poll Shorthorn bull to the Berry Artificial Stock Breeding Station during the year.

Awards for Competitive Exhibits.—Four Poll Shorthorn bulls were exhibited at the 1961 Sydney Royal Show, one gaining a second prize. The four bulls were sold, for a total of £1,417 10s. 0d.

Eight Angus bulls were exhibited there, and their awards comprised a Reserve Championship, five Firsts, two Seconds, and one Third. Six of the bulls exhibited were sold, for a total of £2,961.

Two Poll Shorthorn steers were exhibited there in the Fat Cattle Section. They gained First and Third places in the respective class, and were sold by public auction for £55 each.

Horses

At 31st May, 1961, the Department had 236 horses, six less than at that date in 1960.

Service of Privately-owned Mares.—A total of thirty-three privately-owned mares were sent for service by stallions owned by the Department; twenty-six at Hawkesbury Agricultural College and seven at Wagga Agricultural College.

Awards for Competitive Exhibits.—The Department gained the following awards with its Arab horse exhibit (from Wagga and Hawkesbury Agricultural Colleges) at the 1961 Sydney Royal Show: One Championship, three Firsts, one Second and two Thirds.

Saanen Goats

Despite heavy loss of breeding Saanen does at Condobolin Experiment Farm, the quality standard of the stud has been maintained. There is high demand for Saanen does in particular. Young bucks have been sold without difficulty.

POULTRY BRANCH

Industry Trends

Registration of Flocks.—Registration of poultry flocks with the Egg Marketing Board became compulsory last year.

The following statistics were compiled by the Egg Marketing Board:—

Summary of Poultry Farm Registrations
1st November, 1960

Size of farm	No. of farms	No. of stock
Under 75 layers	3,374	152,969
76-150 layers	1,539	166,528
151-500 layers	1,691	489,394
501-1,000 layers	870	646,108
1,001-2,000 layers	912	1,344,687
2,001-5,000 layers ...	901	2,757,929
5,001-10,000 layers	181	1,181,495
10,000 and over layers	46	823,213
Total	9,514	7,562,323

Farm Size Trends.—Data from the Flock Registrations indicates a decline in the number of farms operated as a one-man or family unit. The greatest volume of production is from holdings with 2,000 to 5,000 layers.

Broiler Growing Increased.—Production of poultry meat, broiler chickens in particular, continued to increase. Estimated production was eight million chickens raised. The supply more than equalled demand, and for a period of the year prices fell to uneconomic levels.

Poultry Breeding

Breeder Accreditation Scheme.—Breeders are still co-operating with the accreditation scheme under the New South Wales Poultry Improvement Plan (Eggs). Since the inauguration of the Plan in 1954, there has been a significant improvement in the class of stock available to commercial egg producers. Specialised breeding has become a highlight of poultry industry progress.

Official Laying Tests—Less Important Now.—The industry is now more dependent on random sample tests to evaluate the productive qualities of commercial strains.

The accredited breeders' test was discontinued because the equipment could be better used to test the end-product or the type of chicken sold to the commercial producer. The size of each sample has therefore been increased to 130 pullets, and not less than 100 layers from each breeder will be housed for testing. Sixteen new testing pens have been erected at Hawkesbury Agricultural College. Accommodation is fully taxed in the testing of over 3,000 layers, consisting of twenty-five samples from the leading breeding-farms.

Random Sample Test.—Broilers—The first official broiler test at Hawkesbury College commenced in January, 1961, with nine samples each of 300 eggs from breeders of meat-strain chickens. This test required the rearing of 1,440 chickens to an age of twelve weeks. The results were based on growth rate and food conversion efficiency. They indicated steady progress in the breeding of meat-producing strains.

Attendance of 1,300 visitors for the Annual Field Day at Hawkesbury demonstrated the interest in these tests at the College.

Poultry Research Station—Equipment Improved.—New equipment at the Seven Hills Poultry Research Station comprises a section of housing with 2,400 cages for the testing of breeding lines selected for individual and family merit. A house for the testing of broiler strains was also completed.

A detailed report of research at the Station is presented elsewhere in the Division of Animal Industry section of this Report of the Department.

Extension Work in Poultry Industry

Staff.—Two livestock officers (poultry) were appointed and are stationed for initial training at Hawkesbury College (one) and the Poultry Research Station (one). The newly appointed livestock officer at the Poultry Research Station has assisted the research officers in general management connected with research projects, whilst being trained for extension work. One other officer transferred to the Department of Education.

The staff is still below established strength, and it has not been possible to have an officer with sufficient experience permanently stationed in the Gosford-Newcastle area. The Parramatta District officer continued to visit there for one week each month.

Four poultry livestock officers were engaged in district extension work in the Cumberland, Gosford, Wyong, Tamworth and Wagga areas. The districts where these officers are permanently stationed provide more than 90 per cent. of the State's egg and poultry meat production.

Types of Extension Work.—A large part of the field officers' work is by personal contact; but they also prepare articles, give radio broadcasts and lectures, and arrange the holding of field days.

The two district livestock officers working in the metropolitan area were almost continually accompanied by veterinary students and/or Colombo Plan students, or by interstate or overseas visitors—including migrants who contemplate entering the poultry industry.

Trends towards more intensive methods of farming have increased the extension work. New farms are being established with "lay-out" on modern principles. Many older properties are being re-designed for more efficient utilisation of labour. There is a notable improvement in farm husbandry practices.

Statistics of Field Duties.—The following figures summarise poultry officers' field duties for the year:—

Visits to private farms	1,618
Field days serviced	17
Poultry schools serviced	3
Visits to Government institutions	52
Meetings attended and serviced	37
Lectures	41

National Poultry Exhibition—XIIth World Poultry Congress, Australia, 1962

Early organisation has been undertaken for this Exhibition in co-operation with the Commonwealth and the Departments of Agriculture in other States. The exhibit, a panoramic display of all phases of poultry production, will be financed from Commonwealth Extension Services Grant funds.

PIG BRANCH

Following an increase in production of pig meats throughout Australia, pig prices fell drastically during the last six of the twelve months under report. The outbreak of swine fever also disrupted the market.

Staff.—Two livestock officers were appointed to the Branch and one resigned. The staff position is now as follows: one Principal Livestock Officer (Pigs), five Senior Livestock Officers, and six Livestock Officers, and one vacant Livestock Officer position.

Department's Pig Herds

The herds (at Hawkesbury, Wagga, Wollongbar and Grafton) were satisfactorily maintained. They were used mainly for student instruction and for research. One boar and four sows of the Landrace breed were added to the Hawkesbury Stud. Their progeny will later be distributed to the Wagga and Wollongbar herds and to institutions under the control of other Departments.

A total of 879 pigs was disposed of; including 64 stud pigs. The number of stud pigs sold to farmers for breeding purposes was only one-third of the number sold in 1959-60. This decline reflected quarantine restrictions arising from infectious rhinitis and swine fever.

Extension Services

Range and Statistics of Field Work:—The field activities of livestock officers in extension (and regulatory) duties for the pig industry are summarised in the following table, with inter-year comparisons:—

	1958-59	1959-60	1960-61
Farms visited	1,301	1,397	1,471
Meetings attended and serviced	55	62	85
Pig sales attended	111	139	147
Field days attended and serviced	36	61	51
Bacon factories visited and serviced	48	79	97
Experiment farms visited and serviced	56	147	131
Shows attended and serviced	38	26	29
Lectures and demonstrations given	111	108	148
Broadcasts made	49	75	93
Swine Branding Act (inspections)	34	30	37

Much time was also devoted to answering requests at in-person interviews, and by correspondence and telephone, for advice on all phases of pig-raising.

Press Releases and Journal Articles.—Numerous press releases were supplied to daily and weekly newspapers, and five articles were contributed to journals (*see Appendix II*). In addition, many thousands of printed pamphlets on breeding, feeding, housing, management and marketing of pigs were distributed.

School for Farmers.—The annual four days School for Pig Raisers was held at Hawkesbury Agricultural College, and attended by farmers from many areas.

Assistance to Other Departments and Organisations.—Advice was given on management of pig herds maintained at institutions controlled by the Departments of Prisons, Health, Education and Child Welfare. Breeding stock was also supplied as required.

The services of livestock officers were also freely called upon by many farmers' organisations, the Junior Farmers' Club movement, the Australian Pig Society, the Royal Agricultural Society, numerous country Agricultural Show Societies, the Australian Meat Board and the Rural and Commonwealth Development Banks.

In-service Training

A refresher school for Livestock Officers (Pig Branch) was held at Wollongbar Agricultural Research Station, to review extension methods and research work in all phases of pig-raising.

APICULTURE BRANCH

State of the Industry

Honey Production Light.—New South Wales production was much lighter than in 1959-60. Best areas were the south coast and central districts. Unsatisfactory honey prices caused producers to economise on hive migration, so production was further reduced because of this factor.

Depressed Market.—The honey market remained depressed. Unsatisfactory prices on the local market as well as for export honey forced some producers to seek other employment, temporarily at least. Few people entered the industry and full-time apiarists strove to keep production costs down.

Marketing Conferences.—Efforts were made to increase the sale of honey on the local market. This generally yields the best prices. Departmental officers attended a number of marketing conferences. Considerable time was spent by them in investigating and discussing various schemes.

In view of the dispersed nature of this industry, unity amongst the producers is hard to secure; so organisation of their market is very hard to achieve.

Extension and Regulatory Service

Staff.—A livestock officer (apiculture) has been transferred from Head Office to the Western Agricultural Region, with headquarters at Orange. From Orange headquarters he is providing an extension and regulatory service to beekeepers; and an advisory service to farmers requiring bees for pollination.

The Department now has apicultural officers located at Wagga, Orange and Tamworth; in addition to the Principal Livestock Officer (Apiculture) at Head Office and a Livestock Officer (Apiculture) at Hawkesbury Agricultural College, Richmond.

School for Beekeepers.—A very successful summer school in apiculture was held at Hawkesbury Agricultural College in January, 1961. The course included both theory and practice, through lectures and demonstrations.

A Regional Beekeepers' School.—This was conducted at Albury. Its success has assured the promotion of similar short-term schools in other rural areas.

Use of Mass and Group Media.—Besides valued assistance to individual beekeepers and farmers, livestock officers (apiculture) addressed beekeepers at their meetings, and attended Agricultural Bureau field days and Departmental field days. They also prepared material for radio and press releases.

In view of the large district allocated to each officer, the officers had to place great weight on group and mass extension methods.

Bee-breeding Programme

Further developments were achieved with the bee breeding programme (at Hawkesbury Agricultural College). Special queen-rearing nuclei were made up, to accommodate new lines being developed in the College apiary. (There is further reference to this work in the Hawkesbury Agricultural College section of this Report of the Department.)

Bee Diseases

American Foul Brood Disease (*Bacillus larvae*).—Several minor outbreaks were controlled in rural and near metropolitan areas. The most serious outbreak occurred at Nowra. There, about 150 hives had to be destroyed because of it.

Nosema Disease (*Nosema apis*).—Losses caused by this protozoan were small.

Sac Brood Disease.—Losses due to this disease were neglibible.

Acarine Disease (*Acarapis woodi*).—A considerable number of queen bees were received from overseas, from America in particular. No Acarine mite was located. The mite has never been observed in New South Wales and every effort has been made in accordance with Commonwealth Quarantine Regulation 32 to keep the country free of it.

DIVISION OF SCIENCE SERVICES

Biology Branch

PLANT PATHOLOGY SECTION

New Plant Disease Records

Seventy-four new records of plant disease were made in New South Wales.

The common grey mould fungus *Botrytis cinerea* Pers. ex Fr. was recorded in twelve new hosts and caused damage to seedlings of several native plant species in the Forestry Commission's Nursery at West Pennant Hills.

Powdery mildews (*Oidium* spp.) were also present on many native species in the same nursery, and oak powdery mildew was recorded on young trees of several species of *Quercus* at Canberra.

Other interesting records include a spear rot of asparagus caused by a species of *Phytophthora* (stated by the Commonwealth Mycological Institute to be similar to *P. richardiae* Buis.); an extension of the host range of the cucurbit gummy stem blight fungus (*Mycosphaerella melonis* (Pass.) Chiu & J. C. Walker); occurrence of psorosis of citrus on grapefruit; occurrence of pink limb blight (*Corticium salmonicolor* Berk. & Br.) on pear trees; and on beds of cultivated mushrooms a species of *Mycogone* similar to *M. rosea* Linm. ex Chev.

Thanks are given to the Forestry Commission of N.S.W. and the Forestry and Timber Bureau in Canberra for their co-operation in obtaining many of the records.

Cereal Diseases

Wheat Diseases.—The season, although somewhat dry in the north, was good. Diseases caused no major losses, but there were some interesting features.

There are now present stem rust strains which can attack the widely-grown varieties Glenwari, Festival and Spica and the new varieties Kenora, Gala, Hopps and Gamenya. Whether or not these wheats will in future be seriously affected by stem rust will, however, depend upon the rate of build-up of spores of the new strains.

Occurrence of bunt continued to increase as noted last season, and thirty-one growers were listed by the Australian Wheat Board as having delivered bunt-affected grain. Of these, ten were from the West Wyalong district. In the few specimens examined the spores were smooth, indicating that they were those of *Tilletia foetida*. Use of the simple and efficient seed treatments recommended by this Department gives excellent prevention of this disease. Treatment should always be carried out, as a precautionary measure.

Foot-rots and take-all were again conspicuous, particularly on improved pasture land.

Isolates of a *Fusarium* species from foot-rotted plants from the north-west were examined. As is the case in southern Queensland, it was identified as *Fusarium graminearum*. Its pathogenicity has been demonstrated and this fungus is obviously the most important foot-rot pathogen in the northern wheat belt.

Virus Diseases of Cereals.—A visit was made by Dr. John T. Slykhuis of the Canada Department of Agriculture, a world authority on virus diseases of cereals and grasses. He travelled in New South Wales in the company of officers of the C.S.I.R.O. and this Department. As a result, some interesting records were made and attention was focussed on this group of diseases.

The barley yellow dwarf virus, recognised here for some years now, was found throughout the State in wheat, oats and barley, but instances of important damage were very rare.

Wheat plants showing symptoms suspected of being striate mosaic were also found, and there were several records of previously-undetected viruses of grasses. These were not important on the whole, but recognition of their presence has drawn attention to dangers of misinterpretation of results in breeding work and other trials.

Oat Diseases.—The position was much the same as in previous seasons, except for a first record of the nematode disease root-knot (*Meloidogyne javanica*) in a crop at Dorrigo.

Maize Diseases.—Stem- and cob-rots (*Fusarium* spp. and *Diplodia zeae*) and leaf blight (*Helminthosporium turcicum*) continued to be the main causes of loss. Leaf blight caused little damage to sweet corn crops. In the previous season they were severely affected.

Work with the stem- and cob-rotting organisms has been recommenced, to classify the organisms in the light of modern knowledge and to study their pathogenicity. This could lead to better control through breeding for resistance and other measures.

Forty-two hybrids and inbreds were field-tested for resistance to head smut (*Sphacelotheca reiliana*). A wide range of variation in susceptibility was revealed, indicating the need to take care against production of hybrids which are unusually susceptible. In addition, a satisfactory method of pot testing in glasshouses has been developed.

Occurrence of the destructive tropical maize rust (*Puccinia polysora*) in New Guinea and northern Queensland has led to speculation on whether it will extend as far south as New South Wales. All collections examined so far have proved to be *P. sorghi*. The position is being closely watched.

Sorghum Diseases.—Inspections of quarantine areas on the northern tablelands and slopes enabled close examination of a very large number of sorghum plants. Diseases were surprisingly few. The most interesting was a previously unrecorded mosaic, striation and stunting. This is thought to be caused by a strain of the sugar cane mosaic virus. It was subsequently found in commercial crops of grain sorghum as well as in Sudan grass (*Sorghum sudanense*) and *Sorghum almum*.

Sorghum is prone to stalk rots very similar to those affecting maize. A study of these diseases has been commenced in conjunction with the maize work.

Diseases of Rice.—Some non-parasitic spotting and discolouration occurred. Otherwise, no rice diseases were observed in the field in New South Wales. In a quarantine house at Yanco Agricultural Research Station a bacterial disease was detected on introductions. All plants in the house were destroyed at once and the house was disinfected. It is hoped that the disease has been eradicated and that rice growing in New South Wales will continue in its fortunate state of being disease free.

Diseases of Pasture Plants

Diseases of Grasses.—False smut (*Helminthosporium ravenelli*) of *Sporobolus* sp. has for the second time been suspected of poisoning cattle. Ergot (*Claviceps paspali*) of paspalum was also suspected of causing poisoning as also was a well-developed pasture which was dying off in the autumn. In the latter case no fungus or disease known to be toxic was detected, nor any trace of *Pithomyces chartarum*, the fungus reported to cause facial eczema of sheep in New Zealand.

Minor investigations have continued into the cause of unthriftiness of turf. In the case of couch at least, a disease of the stolons caused by a non-sporing fungus, and a failure to respond to fertilisers—associated with a high population of spiral nematodes in the soil—are worthy of further investigations.

To find a suitable deterrent for black scum, numerous chemicals were laboratory-tested for their ability to kill or prevent the growth of algae. Several proved extremely effective but have not been field-tested.

An unidentified decline of kikuyu on the north coast has again been conspicuous and has caused concern in some areas. Investigations have not revealed the cause.

Dr. Slykhuis' visit focussed attention on virus diseases of grasses. Suspected infections were observed in cocksfoot, Rhodes grass and phalaris.

Clover Diseases.—Most clover diseases recorded were, as usual, unimportant. However, burn (*Pseudoplea trifolii*) caused damage on the coast, particularly on white-clover varieties in Taree district.

Root knot came under closer scrutiny. It seems widespread on the coast and is reported to have caused conspicuous damage in the Lismore district. All collections examined so far have proved to be *Meloidogyne javanica*. Examination of soil samples has shown that numerous free-living parasitic nematodes are present as well. An unthriftiness of various clovers and other pasture legumes at Seaham near Maitland may also be associated with the presence of nematodes.

Lucerne Diseases.—The forked-root condition mentioned in the last report has been further examined. In the soils concerned root-knot and other nematodes have been found. Seedling rot roots have also been observed. It is clear that, in most cases, the soils are poor nutritionally. Further investigation should elucidate this problem.

Tobacco Diseases

Research on tobacco diseases has been suspended until an appointee is found to replace the plant pathologist who was on this work but resigned to take up a University teaching career.

Mechanism of Resistance to Blue Mould.—It is possible that the mechanism of resistance to blue mould (*Peronospora tabacina*) of resistant lines bred at the New England Agricultural Research Station is of a chemical nature involving a polyphenol/polyphenolase reaction. It has not been possible to confirm this theory as the necessary chemistry assistance has not been available.

Resistance Trials for Hybrids.—Plots of the A2 hybrid and also the commercial hybrid Hicks were planted at Bega, Moruya, Kiama, Maitland, Urunga, Coff's Harbour, Grafton and Kyogle. The resistance to blue mould infection by A2 was good in all districts, while Hicks was fully susceptible.

Dormancy in Seeds.—Dormancy observed in the seed of hybrids and in many of the wild *Nicotiana* species is a major problem. It affects commercial production of seed of the blue mould resistant lines. From seed bed observations, poor germination of commercial varieties under certain conditions may not be due to poor viability, but to seed dormancy.

Chemical Treatments for Blue Mould.—In the glasshouse conditions at New England Agricultural Research Station, paradichlorbenzene gave unsatisfactory control of blue mould and plants had to receive supplementary sprays with zineb. Benzol could not be used because of fire risk.

Diseases of Vegetable Crops

Potato Seed Certification.—Records of the Division of Plant Industry show that, for the sixth successive season, no potato crop submitted for certification on the tableland areas of New South Wales was rejected for excess leaf-roll content. Certified seed's high freedom from this disease has been maintained.

On the central tablelands, 29 acres of Sebago, representing five crops, were rejected from certification because greater than 1 per cent. of the plants showed a "witches' broom" condition. Less than 1 per cent. "witches' broom" occurred in three other Sebago crops and in one crop of Sequoia. The disease was not seen in northern tableland crops, and very few affected plants were observed in southern tableland crops. The disease is described in a later paragraph.

Other rejections in crops submitted were 20 acres (four crops) for excessive content of blackleg (*Bacterium carotovorum*) and 9 acres (two crops) for excessive content of *Fusarium* wilt (*F. oxysporum* f. *tuberosi*).

Potato Late Blight (*Phytophthora infestans*).—This was of little economic importance in New South Wales potato crops. Light infection was recorded on some crops near the metropolitan area and on the central tablelands.

Development of Potato Varieties Immune to Late Blight.—In co-operation with Division of Plant Industry, this project has been continued. This year's results showed that six agronomically promising seedlings were resistant to race "O" of *P. infestans*. Two of these seedlings were derived from the American variety Cherokee, two from the American seedling B595-76 and two from the Scottish seedling 1521(c)3.

Nine seedlings of Mexican origin, highly resistant under severe blight conditions in that country, have been imported for use in the breeding programme.

Potato Common Scab (*Streptomyces scabies*).—Work towards development of scab-resistant varieties continued, in co-operation with Division of Plant Industry. Cultures of the fungus have been supplied to the potato breeder, to test in vermiculite culture the reaction of seedlings derived from scab-resistant parents. Use of the South American variety Emilia (*Solanum andigenum*) and the variety Cherokee as parents has continued.

Potato Rugose Mosaic (*Potato Virus X + Potato Virus Y*).—In 1958, the variety Walanga was no longer accepted for certification in New South Wales because of its high susceptibility to and tolerance of potato virus Y (PVY). Uncertified Walanga was still being grown in 1961 by producers of certified seed, but action has been taken to assure that future crops submitted for certification will be rejected if the variety Walanga is being grown on the same property.

Two agronomically promising Departmental seedlings (S2821 and S2854) were tested for their reaction to PVY following aphid inoculation in the field. Under field conditions, these seedlings reacted to current season infection by producing the "leaf drop streak" symptom. There is therefore no objection, from the point of view of reaction to PVY, to the naming of these seedlings.

Potato "Witches' Broom" Disease.—Three of the five Sebago crops rejected from certification on the central tablelands each contained 30 per cent. affected plants.

Affected plants were dwarfed, usually about half the height of healthy plants, in the case of Sebago. The dwarfing was less pronounced in the case of affected Sequoia plants. Up to 25 stems were produced on affected plants. These were rounded in cross section, in lieu of the normal triangular configuration. The leaves were smaller than normal and there was some bunching of the leaves at the top of the stems. There was a marked increase in the number of stolons. These were thinner than normal. Many small tubers were formed, and an increased number of fibrous roots.

The disease has been shown to be tuber-transmitted. Work is in progress to determine its exact nature.

Yellow Top (*Virus*) *of Tomato.*—It has been established that this disease is transmitted by the aphid *Macrosiphum euphorbiae* in which the virus is persistent. Aphids acquire maximum transmitting ability after feeding on infected plants for eight hours, and maximum transmission occurs after a feeding period of three hours.

Heavy infections of this disease were present during the season in central-coast crops where eradicative spraying for control of the aphid vector had not been done. Infections of 70-80 per cent. recorded in these crops indicated that aphid vector infestation had occurred.

Observations were made at Dural on the incidence of yellow top in plots treated with the recommended meta-iso-systox (M.I.S.) spray and also a plot treated with a routine rogor spray. The crop was divided into four blocks each of 2,000 to 3,000 plants.

The three sections which received weekly applications of 0.025 per cent. M.I.S. showed respectively 5.7, 5.7 and 4.6 per cent. yellow top infection when fruit-picking commenced. The plot receiving weekly 0.04 per cent. rogor treatment showed 6.8 per cent. infection at that time.

Another crop at Dural which had received weekly applications of 0.025 per cent. M.I.S. showed 0.1 per cent. yellow top, and a crop at West Pennant Hills which had received 7-9 day applications of 0.025 per cent. M.I.S. showed 7.0 per cent. yellow top.

In a trial at the Citrus Experiment Station, Narara, plots of tomatoes receiving weekly high-volume applications of rogor (0.04 per cent.) showed 3.4 per cent. yellow-top at the end of the season. Plots misted weekly with rogor at 0.02 per cent. strength showed 4.1 and 5.3 per cent. yellow top respectively.

Systemic aphicides do not protect, but they prevent spread of this disease within the crop.

Spotted Wilt (*Virus*) *of Tomato.*—During spring and early summer, spotted wilt was epidemic in many Gosford crops. Infections up to 70 per cent. were recorded. Weekly application of meta-iso-systox had slight (if any) influence on spotted wilt incidence at Gosford, similarly in a Sydney crop which showed 14 per cent. spotted wilt as against 0.1 per cent. yellow top.

Tomato Fusarium Wilt (*Fusarium oxysporum* f. *lycopersici*).—Cultures of this fungus were prepared for use by Division of Plant Industry in the programme of breeding varieties resistant to this pathogen.

Phytophthora Spear Rot (*Phytophthora* sp. near *richardiae*) *of Asparagus.*—It was recorded for the first time in this State, and caused considerable loss in cut asparagus spears held in cold store at Batlow.

The incidence was associated with very wet weather. Infection probably occurred in the field at or about harvest time and the rot progressed in storage. The trouble disappeared with the advent of dry weather.

Bean Seed Certification Scheme.—In co-operation with Division of Plant Industry, the Bean Seed Certification Scheme continued for the eighteenth successive season. Seed yields were reduced because of severe flooding on the south coast.

Thirty crops were accepted for certification and six crops were approved. One crop of the Queensland variety Redlands Belle, which shows good resistance to rust in the field, was among the crops certified. Two crops of this variety and one crop each of the varieties College Early and College Supreme, recently released by the Department, were included in those approved.

Of the twenty-one crops not certified, eight were rejected because of anthracnose, one because of halo blight, three for lack of isolation, one for excessive weed growth, four were lost because of rain and four were picked for green beans.

Disease-resistance Lines in Beans.—The results of work on variation in reaction to the disease anthracnose (*Colletotrichum lindemuthianum*) within bean varieties were published during the year.

This work has shown that many of the common varieties are composed of lines which react differently to the same strain of anthracnose. It is thus possible in some cases to sort out, from a variety previously thought to be completely susceptible to the disease, a completely resistant line.

In this way, it should be possible to improve the disease resistance of many varieties of beans.

This variation in disease reaction is also important from the point of view of studies on physiologic races of plant pathogens. If care is not taken to use pure line differential varieties, the worker may be tending to study host variation rather than variation in the pathogen.

Because of staff reorganisation, testing bean breeding material has been discontinued by Biology Branch. Promising lines have been handed over to Professor W. L. Waterhouse.

Rockmelon Powdery Mildew (*Oidium* sp.).—*Breeding*: In the Murrumbidgee Irrigation Areas and Lower Murray districts, breakdown of resistance of varieties P.M.R. 5 and P.M.R. 6 occurred in the autumn of 1960. It was then decided to introduce, with the co-operation of Division of Plant Industry, all rockmelon lines possible from overseas, particularly from Asia. In Asia the fungus *Sphaerotheca fuliginea* occurs. The local fungus resembles it in many respects.

Eight lines were obtained from India, five lines from Brazil and forty lines from California (these of Oriental origin).

A large group of the introductions from California has shown complete resistance to powdery mildew at Yanco Agricultural Research Station. A source of resistance has thus been obtained speedily. This will enable the Departmental breeding programme for resistance to powdery mildew, in combination with the programme for resistance to *Fusarium* wilt (*F. oxysporum* f. *melonis*), to proceed immediately at Yanco Agricultural Research Station.

The Californian lines are not agronomically acceptable and are of value only as a source of resistance. Therefore, a number of years will elapse before a variety suitable for local commercial culture and with the required disease resistance will be released.

Plantings of the varieties P.M.R. 5, P.M.R. 6 and P.M.R. 45 at Rydalmere in the 1961 autumn showed resistance to powdery mildew, whereas the variety Bender's Surprise was highly susceptible. It is thus possible that the strain of *Oidium* in the south-west is different from that at Rydalmere.

Examination of the fungus where present on three of these varieties showed that it conformed to the imperfect stage of *Sphaerotheca fuliginea.*

Attempts are being made to induce the formation of the perfect stage in order that the fungus may be definitely identified.

Spraying for Rockmelon Powdery Mildew Control.—Trials have been carried out to assess the value of a number of fungicides for field control of powdery mildew on rockmelons—at Griffith, Dareton, and Rydalmere, and also on marrows, at Rydalmere.

Weekly spray applications of the experimental fungicide Bayer 4964 at 0.009 per cent strength and of Karathane 40.025 per cent strength have given a very high degree of control of the disease on rockmelons. These two fungicides (and also weekly applications of dusting sulphur) control the disease on marrows.

Cucurbits Gummy Stem Blight (*Mycosphaerella melonis*).—Recorded for the first time in New South Wales in 1960, on watermelon, this disease is now widespread in the coastal areas.

A severe outbreak has occurred in watermelon crops in the Hawkesbury River area. Weather favoured it in the summer. The average loss in the district was about 30-40 per cent. In some cases 80 per cent. of the crop was lost.

Seed transmission of the disease has now been shown. Because no satisfactory seed treatment has yet been devised, adequate crop rotation remains the main control.

Gummy Stem Blight has also been recorded on rockmelon and on pumpkin this year, for the first time in New South Wales, but caused little damage.

Cucurbit Anthracnose (*Colletotrichum orbiculare*).—It caused widespread losses in Hawkesbury River district watermelon crops. Even the variety Candy Red (Charleston Grey), previously regarded as resistant to the anthracnose strains occurring in the district, was affected. Losses of 10-20 per cent. of marketable fruit were recorded.

Anthracnose in cucumbers of the Ashley variety at Kurrajong caused rejection of 80 per cent. of the crop on arrival at the Sydney Municipal Markets. Anthracnose has rarely been seen on cucumbers in New South Wales, but in the United States of America there are strains which commonly attack cucumber severely.

Glasshouse inoculations of the varieties Ashley, Palomar, Stono, Marketer, Palmetto and Early Fortune have shown all to be completely susceptible to the anthracnose strain isolated from the diseased crop.

Stunting and Rosetting Pea Disease (*Cause unknown*).—A serious outbreak of an unknown disease of peas not previously encountered occurred on the central tablelands in the summer. The disease was general in the central tableland pea-growing areas, including Millthorpe, Oberon and Blayney. Stunting and rosetting and markedly depressed pod development led to heavy losses. All crops were a partial failure. Complete crop loss was reported in many instances.

The cause of the disease is not known but on symptoms it would be a virus. This is being investigated by C.S.I.R.O. officers.

Misting Machines in Vegetable Disease Control.—The misting project was continued at the Citrus Experiment Station, Narara. The results confirmed that equal control of early blight (*Alternaria porri* f. sp. *solani*) was obtained when copper oxychloride was applied to trellised tomato crops at equivalent amount of active ingedient by routine weekly application of high volume spray and by misting machine. The efficiency of control of this disease by applying only half the quantity of copper oxychloride through a misting machine was also tested. The results, yet to be statistically analysed, showed that the highest yield of clean fruit (e.g., fruit free of early blight infection) was obtained from this "half mist" treatment. The high volume spray treatment gave better results than the "full strength" mist treatment.

Chemistry Branch has co-operated in assessing the relative efficiency of high volume spraying and misting in terms of adequate copper coverage of the plants. Results of the chemical analyses are not yet available.

Mushroom Culture

Surveys of Indoor Growing.—Surveys were done to determine the extent of indoor mushroom growing in New South Wales, and the efficiency of the structures in providing cultural conditions for the crop.

The trend towards indoor culture noted in last year's report has continued. Demand by processors for a supply of good quality mushrooms over a longer period has increased. This demand can only be met by production under properly controlled indoor conditions. The outdoor "ridge-bed" type of culture, previously extensively practised, offers no surety of production; and often the mushrooms are inferior.

Mat Disease (*Myceliophthora ? lutea*).—This disease was recorded four times during the year, three times in the Sydney metropolitan area and once at Picton. Losses in individual crops ranged from 5 per cent. to about 50 per cent.

Since it was first recorded in New South Wales in 1958, mat disease has become more widespread in the metropolitan area. In outdoor ridge-bed culture, no control is possible. In indoor culture the use of combined steam and formaldehyde sterilisation is necessary to control the fungus in infested casing soil and infested houses.

A Brown Blotch Disease.—This caused cap discolouration in an indoor crop at Peakhurst. It was brought under control by watering the beds with chlorinated water at a strength of 100 p.p.m. chlorine.

Mycogone sp.—An unidentified species of fungus of the genus *Mycogone* caused some loss in an indoor crop at Cattai.

Citrus Diseases

Citrus Blast (*Pseudomonas syringae*).—Periods of cold windy rain in the spring, after severe winter frosts, led to the most widespread and severe outbreak for many years in the south-west. The previous autumn had been mild and the considerable autumn growth made by orange trees in particular was blighted. Losses of nursery trees and stocks were heavy.

Phytophthora Diseases.—As a result of the high degree of resistance to *Phytophthora citrophthora* shown by seedlings of Scarlet Mandarin in previous tests, further collections of this variety from a number of sources have been made and testing for resistance commenced.

Queensland reports have indicated that local strains of Cleopatra mandarin were less resistant to *Phytophthora parasitica* than was a Florida selection. A collection of Cleopatra mandarin has therefore been made from several different sources, to find out whether variability in *Phytophthora* resistance occurs; and testing for resistance to *Phytophthora citrophthora* has commenced. Seed of Cleopatra mandarin is also being obtained from Florida for trial. Hybrid seedlings of Cleopatra x *Poncirus trifoliata* are also under test.

Virus Diseases.—Observations, in collaboration with Division of Horticulture, were continued on experiments designed to find out the relationships of scalybutt and stunting of trees on *P. trifoliata* stock; and on protection of grapefruit from field infection by severe stem pitting by inoculation with mild strains.

Surveys were commenced of a number of orchard blocks of mature Washington navel orange on *P. trifoliata* stock, and the type of scaling was studied. Though some variation occurs two main types were distinguished—(1) Persistent scaling of all butt area to bud union, without pitting of the wood surface of the stock; (2) Intermittent and sporadic scaling, with development of patches of scales, and groups of rounded rough protuberances—with pitting of the wood surface of the stock. The possibility that type 2 may be due to a second virus is being explored.

Sudden Death.—Trees inoculated with the suspected pathogen were kept under observation. Progress of the disease in susceptible seedling trees is very slow. The possibility that the state of nutrition of the tree may be important in determining the invasion rate is being explored.

Citrus Black Spot (*Guignardia citricarpa*) *Spray Experiments.*—Promising fungicides were compared at Mangrove Mountain. As well as disease control, valuable information was obtained on aspects of fruit quality (total soluble solids, acidity, and juice content), colour, yield, fruit marking, general market acceptance, and costs of programmes tested. No one treatment completely fulfilled all of the requirements.

A Zineb-oil programme gave very good disease control (92 per cent. clean), clean high quality fruit, practically free from marks; however, juice content was considerably lower, yields were reduced, fruit colour early in the reason was very pale, the rind tended to thicken, and the cost was about a 330 per cent. increase on the standard Bordeaux-oil programme.

Mineral Toxicity Studies

Leaf analysis is helping the diagnosis of mineral toxicities (and nutrient imbalance) in fruit trees. This citrus pot-trial at Hawkesbury College is yielding data on varietal and rootstock differences in uptake of toxic elements.

This latter schedule, with 80 per cent. clean fruit, was much the same as the copper oxychloride and cuprous oxide programmes control of black spot. However, in yield, fruit size, relative absence of fruit markings, and quality, the weak Bordeaux-oils were quite superior. Juice characteristics were comparable with the zineb treated fruit. Colour and external quality were good early and stayed so throughout until harvest in January. The cost for materials was about £10 per acre.

The proprietary fixed coppers, copper oxychloride and cuprous oxide, greatly reduced yield, adversely affected quality, reduced fruit size, and increased fruit marking; but used with white oil, gave black spot control akin to the standard Bordeaux-oil schedule. Costs per acre were very much greater.

Best black spot control (94 per cent. clean) was obtained with a programme comprising an initial application of Bordeaux zinc mixture 5-1-5-100 plus ½ gallon white oil, followed in due course by two copper oxychloride-oil applications. Yield, fruit size, and juice content were the highest for any treatment, including the controls; and the programme cost only slightly more than the present recommendation. Internal fruit quality was very satisfactory, but the colour late in the season deteriorated slightly. Some markings on the fruit were noticeable but generally did not adversely affect market acceptance. Improvement in disease control, yield and size of fruit are attributed to the composition of the initial spray. Further investigation is intended on this approach.

Similar tests with some modifications have been set up again in the present season at Mangrove Mountain, to confirm and gain further knowledge on the points summarised.

With Division of Horticulture, two black-spot spraying trials were undertaken in the Dooralong-Jilliby districts. Funds for these were provided by Wyong Co-operative Citrus Packing House. The trials examined the efficiency of the Department of Agriculture standard Bordeaux recommendation, and a large number of proprietary fungicidal materials, for control of the disease under conditions where experience has indicated that (i) the disease may be easily controlled, and (ii) the disease is difficult to control. The effect of white spraying oil additives on fungicidal efficiency and fruit quality was also tested.

Generally, the proprietary copper oxychloride materials when applied without white oil additives gave decidedly inferior disease control to the weak Bordeaux-oil programmes. When oil was added disease control was better, and akin to the present Bordeaux recommendation, but fruit size, and quality, and yield were greatly reduced.

Cuprous oxide gave good control of black spot, especially when oil was added, but the crop was drastically reduced, and addition of oil further seriously affected fruit quality.

Bordeaux-zinc 5-1-5-100 plus ½ gallon white oil as an initial spray, followed by two subsequent weak Bordeaux mixture applications, gave disease control equal to cuprous oxide-oil. However, yield and fruit size were the best in the trials and fruit colour was quite satisfactory. Under both test conditions this programme gave the best all-round results. It provided the greatest market return per acre for sprayed fruit.

Use of several popular proprietary copper materials resulted in a nett loss in total returns when compared with non-sprayed fruit. The loss in fruit quality was very marked on all the proprietary copper-oil sprayed trees. However, oil spraying, over the experiment (Dooralong) as a whole, increased disease control by about 8 per cent.

Three field days were held on these trials—for field officers of the Department of Agriculture, local growers and interested trade representatives.

At the Citrus Experiment Station, Narara, mineral oil and copper-oil fog applications were tested and compared with the standard Bordeaux-oil programme. Generally the results were very disappointing, in black spot control and the deleterious effect of the oil fog applications on fruit quality, size and surface blemish.

Copper-oil fog applications at 6, 12 and 18 weeks, after an initial weak Bordeaux application at petal-fall, gave somewhat better control (60 per cent. clean) than the same number of oil-fog applications following Bordeaux (30 per cent. clean).

A single, petal-fall Bordeaux application gave 29 per cent. clean, and the weak Bordeaux schedule gave 81 per cent. clean fruit. Fruit marking and small fruit (down to marble size) were a feature of the copper-oil fogged trees.

Low volume aqueous fog applications of a number of fungicides have been intiated in the present season at Narara for black-spot control.

In a fungicide-screening trial at the Citrus Experiment Station, Narara, sprays of ortho-phenyl-phenol and sodium ortho phenyl phenate at a number of concentrations were tested for black-spot control. The results were very disappointing. A lot of fruit blemish and little or no control of the disease occurred. In the present season, the screening of twelve proprietary materials has been undertaken at Narara.

Testing the effect of various concentrations of hydrated lime sprays (a component of Bordeaux mixture) on mature fruit quality, when applied to immature Valencia oranges the previous summer, some very interesting results were obtained.

Hydrated lime applied in this manner, contributed nothing to the control of black spot. However, the sooty blotch disease (*Gloeodes pomigena*) on the surface of the fruit was completely controlled, and rust mite damage was very greatly reduced. Bordeaux mixture applications have been observed to exert this effect repeatedly, but it was not suspected that the influence was due to the hydrated lime component. A marked difference in fruit size and juice content was observed between sprayed and non-sprayed fruit, on half-sprayed trees. It is considered that the hydrated lime content of Bordeaux mixture sprays to young Valencia fruits generally exerts a favourable influence on fruit size and yield in the Gosford district.

Post-harvest Dip Treatments, against Citrus Black Spot.—In co-operation with the Citrus Wastage Laboratory, Gosford, the efficiency of a number of post-harvest dip treatments in reducing black spot development on stored Valencia fruits is under further examination.

Lemon Scab Disease (Sphaceloma fawcettii var. scabiosa).—A trial at Erina compared a number of proprietary fungicides with the strong Bordeaux-oil recommendation for lemon scab and melanose control. Bordeaux mixture 6-6-80 plus ½ gallon white spraying oil proved superior to all other treatments as a general purpose fungicide for petal-fall application on old Eureka lemon trees. Where melanose is likely to be a problem as well (old trees with some dead wood) Bordeaux mixture should certainly be preferred.

For use in nurseries as a foliage spray on rough lemon seedlings, and for use on young orchard planting of Eureka lemons, zineb (80 per cent.) at 1½ lb. per 80 gallons with ½ gallon of white oil may be used with advantage. Both strong Bordeaux and zineb may be combined safely with sulphur for silver mite scurf control. Ziram, thiram, maneb and copper oxy-chlor-sulphate did not appear to be of value for control of these two lemon diseases.

Etiology of Brown Spot of Emperor Mandarin.—Inoculation studies with a pathogenic strain of *Alternaria* sp. were continued on a number of citrus species and varieties. Several different types of *Alternaria* sp. have been isolated from different species of *Citrus*, but it has not been possible to establish relationship between any of them and the causal pathogen.

Laboratory tests of the efficiency of a number of materials as fungicides, etc., on dead twigs bearing macrospores of this pathogenic *Alternaria* sp. are proceeding.

Citrus Nutrition Experiments.—A long-term citrus-nutrition pot experiment has been continued, in co-operation with the Chemistry Branch and Division of Horticulture, at the Citrus Experiment Station, Narara.

Results to date (first-year harvest) indicate interesting relationships between level of applied nutrient and mineral composition of the leaves. A number of main effects as well as first and second order interactions have been established statistically. Similar relationships have been established with regard to yield,, fruit size, and various aspects of juice and fruit quality. The tests will be continued, to obtain information on the effect of time on these trends.

Diseases of Deciduous Fruits

Apple Black Spot (Venturia inaequalis).—Infection conditions were very favourable in most of the highland districts in the 1960-61 season but the degree of control achieved by growers generally was of a very high order.

Adoption of New Apple Black Spot Recommendations.—There has been immediate large-scale adoption of the recommendations released in autumn, 1960, for post-harvest eradicant treatment. Growers are now very satisfied with their results.

Most popular of the recommendations has been the cheap 0.01 per cent. Phenyl Mercuric Chloride treatment, and a subsequent full schedule of protective sprays or the "after-infection" method of control in the spring.

Using this latter, a prominent grower at Orange harvested a black-spot-free 1,000 bushels per acre crop. His programme for black spot control comprised a post-harvest spray of 0.01 per cent. P.M.C. followed by four post-infection applications of 0.005 per cent. P.M.C. in the spring.

Spray Eradication of Saprophytic Development of V. inaequalis.—An experiment was set up at Orange in autumn, 1960, to test the value of a range of fungicides as post-harvest eradicants of *V. inaequalis* in heavily infected Granny Smith apple leaves.

Phygon (dichclone), Aacuram and Melprex (dodine) used at four times the recommended spring dosage had insufficient eradicative action for significant reduction of spores liberated in the following spring.

Phenyl mercuric chloride at 0.05 per cent., as in previous experiments, eradicated *V. inaequalis* completely from the infected leaves, and P.M.C. 0.01 per cent. reduced the inoculum by 97 per cent.

Where Glyodin at the rate of 1 pint per 100 gallons was added to the 0.05 per cent. P.M.C. or the 0.01 per cent. P.M.C., complete eradication of the fungus was achieved.

Complete eradication was also obtained where 0.05 per cent. P.M.C. plus Agral LN as wetter was applied only to the ventral surface of the infected leaves. Where P.M.C. 0.05 per cent. plus Agral LN was appled only to the dorsal surface there was about 90 per cent. reduction in spore production. This showed again the importance of thorough spray application in the field. In particular, it highlighted the need for thorough coverage of the ventral surface—often substantially but not conspicuously infected.

A further large scale experiment has been set up this season with a range of treatments on Granny Smith and Delicious leaves at Orange; and a duplicate series of these treatments on both Granny Smith and Delicious leaves is being overwintered at Bilpin. These treatments involve P.M.C. sprays only, at varying concentrations and with varying adjuvants.

"Simulated Rain" Experiment, Effect on Black Spot Eradicant.—In one of the treatments, leaves were sprayed with 0.05 per cent. P.M.C. plus Agral LN, allowed to dry and one hour later were subjected to simulated heavy rain. Spore production in these leaves was six times as great as in the non-treated. The mercury may have caused a surface sterilization (thereby restricting the competition which *V. inaequalis* would normally encounter) without restricting the *V. inaequalis*—already established below the epidermis. If this result is substantiated it would indicate the need to repeat the spraying if rain were to fall shortly after spraying.

Apple Measles.—The cause, of considerable concern to growers in many areas, remains obscure. Measles is particularly prevalent on Delicious, and often associated with restriction of growth of young trees.

Present evidence suggests that no virus is directly responsible. Also, no consistent nutritional relationship has yet been found in analyses done by the Chemistry Branch.

However, many more instances of severe root weevil damage associatd with occurrence of the condition have been found this season.

Bitter Pit of Apple, Calcium Nitrate Sprays.—A series of ten statistically designed experiments was carried out at Orange. They were spread over two varieties in each of five orchards. In each, five sprays with calcium nitrate at 5 lb. per 100 gallons were applied at monthly intervals, from early November.

Bitter pit developed in the non-treated trees in only one of these experiments, on Granny Smith. In this case, bitter pit incidence was reduced from 22.6 per cent in the non-treated trees to 7.6 per cent. in the treated trees. Most of the pitted fruit from the non-treated trees was severely pitted, whereas most of the affected fruit from the treated trees showd slight pitting only.

The non-pitted fruit from this experiment has been handed to the C.S.I.R.O. Division of Food Preservation, for storage testing. A further assessment will be made after a considerable period in cool storage.

In a reliable grower trial at Batlow the local fruit officer assessed fruit from comparable trees in adjacent treated and non-treated rows. Four sprays of calcium nitrate 5 lb. per 100 gallons were applied at weekly intervals through January. The results, measured on Granny Smith and Stayman Winesap, showed less bitter pit incidence in the sprayed trees; of the same order as that measured at Orange.

The results confirm those now being obtained interstate and overseas. Further investigations will be made, to determine the best and cheapest spray schedule and to assess the treatment on early coastal apples.

Virus Diseases of Pome Fruit.—Transmission investigations continued at Narara with apple measles, apple green crinkle, apple "wood tumour", pear "ringworm" and pear "fissure bark". No evidence of transmission has yet been obtained.

At Orange, a William pear tree showing severe "ringworm" was grafted in 1955 with Winter Cole, Josephine, Beurre Bosc, Packham's Triumph and Williams. The Beurre Bosc and Packham's Triumph grafts both died. The Winter Cole showed good growth and the fruit was good. The Williams had fair growth, and the fruit appeared healthy. The Josephine only made slight growth but the fruit was healthy. The growth on the original Williams was better than previously.

The Deciduous Fruit Tree Improvement Committee again functioned effectively. As a result of the survey promoted, apple ringspot was recorded on Delicious apples at Young and Orange. Previously this disease had been recorded only on Granny Smith.

Gravenstein trees on Jonathan seedling stock which survived heat therapy treatment for flat limb virus inactivation in 1956 are still growing satisfactorily at Bathurst Experiment Farm. The buds worked into seedling stocks at New England Agricultural Research Station are reported to have made good growth.

To make positive identification of the various virus diseases of pome fruits, several indicator plants have been obtained from Melbourne and Adelaide. They will soon be ready for use.

Brown Rot (Sclerotinia fructicola) of Stone Fruits.—Spray and Dip Trials: Four spray trials on two peach varieties tested thirty different fungicides. Applications were made in spring, and pre-harvest. No material gave significant control. The disease incidence was low.

In other tests, Phenyl Mercury Chloride proved ineffective as an eradicant of *S. fructicola* during the dormant period.

Two commercial-size demonstrations of recommended control measures continued in orchards at Leeton and Griffith. Higher levels of brown rot occurred there this year, again showing that the disease is not easily controlled.

Addition of a wetting agent to the fungicide spray was tested in a field trial. Results were inconclusive, but indicated that it might improve control of the disease.

A post-harvest fruit dip in the antibiotic Mycostatin 20 at 200 p.p.m. reduced storage rots by 50 per cent. Coupled with hydro-cooling, this treatment may be of commercial value.

Longevity of Conidia of S. fructicola.—Conidia produced in the spring remained viable until the pre-harvest period, when they could cause fruit infection. High temperatures in mid-summer seemed to reduce viability. High relative humidities and dew killed many conidia in the autumn.

Carpophilus beetle in the Brown Rot (S. fructicola) Infection Chain.—Observations have indicated that *Carpophilus* beetles are mechanical vectors of brown rot and play an important part in the epidemiology. Their effect is responsible for much blossom blight, and infection of injured fruit. Variability of incidence of brown rot in orchards appears to be due to them in part.

Their importance is not in the quantity of infections caused by them, but in the resultant build-up of inoculum capable of causing extensive infection if conditions favour the fungus at harvest.

Brown Rot Spore Population Studies.—Investigations of daily spore population in orchards continued. Results confirmed the observations made in previous years.

Factors affecting dispersal of conidia were more clearly seen:—number and size of conidial sources are important; age (it determines their energy and moisture status) of the conidial sources affects their ability to produce conidia; rain or dew is necessary for sporulation from older conidial sources, and promotes more intense sporulation from fresh infections; for dispersal low relative humidities are necessary; the higher the wind speed, the greater the quantity of conidia dispersed; depletion of conidia is rapid once dispersal has commenced.

Considerable variability in conidial concentrations within an orchard at a given time was noted. This probably reflects varying infection levels. On one day during the current studies the huge quantity of 140,000 conidia/cu. metre of air was noted; the largest dispersal yet recorded in the Murrumbidgee Irrigation Areas.

Practical implications of these results remain as enumerated in 1958-59.

Overwintering of S. fructicola.—Infected peduncles were again shown to be the most important overwintering sites in peach trees. Mummified fruit generally are less important.

Overwintering occurs in mummified fruit on the ground. From these, conidia are transmitted to the trees by *Carpophilus* beetles.

Stone Fruit Rust (Tranzschelia pruni-spinosae) Spray Experiments.—Prune rust control was further investigated at Young. The treatments involved the use of zineb at 2 lb. per 100 gallons and at 1 lb. per 100 gallons with varied dosages of white oil as spreader-sticker.

Assessed in March, all sprayed trees were entirely free of rust—while the adjacent non-sprayed trees in the same row were 75 per cent, defoliated and all remaining leaves were severely infected. At the same date, the fruit on the non-sprayed trees had a soluble solids content that averaged 18 per cent. This fruit was small and dry and, in the grower's opinion, not worth harvesting. By contrast, the fruit on sprayed trees was large, of good quality, and had a soluble solids content that averaged 27 per cent.

As a result, zineb 1 lb. per 100 gallons plus white oil 2 pints per 100 gallons in a three-spray schedule is the now recommended prune rust control programme for the Young district; the sprays to be applied in late-October, early-December and mid-January. The programme has been developed over a period of eight seasons. It is cheap, and easy to apply; and it allows significant increases in yield and quality.

On Early Watts peach trees at Castle Hill, observations in a statistically designed experiment conducted by Technical Officers of Henry York & Co. Ltd., suggested that the new fungicide dithianon is equally as effective in rust control at a concentration of 0.075 per cent. as zineb at 0.13 per cent.

Stone Fruit Shot Hole (Stigmina carophila).—Eradicant Treatments: In an experiment at Young, a winter spray of 0.05 per cent. P.M.C. or 0.01 per cent. P.M.C. failed to provide adequate control of shot hole in almond, apricot and peach. This was in sharp contrast to the good effect of treatment with 0.1 per cent. P.M.C. at the same location in the previous season, and the results with the lower concentrations at East Kurrajong and Wiseman's Ferry. Rain fell shortly after the spraying at Young. This may have been a factor in the failure. In the almond block, early in the season control with 0.05 per cent. P.M.C. was superior to that with 0.01, but later inoculum build-up and dissemination reduced this difference.

At East Kurrajong two "grower trials" were conducted. Single pink-bud applications of P.M.C. at 0.05 per cent. and 0.01 per cent. were compared, on Glengarry apricot trees with a history of severe shot-hole infection. A thiram spray was also applied, in October. Control in each orchard by each concentration was good.

Prevention of Prune Replant Failure.—Observations continued in the two experiments at Young concerning prune-tree replant failure.

In one experiment D'Agen prune trees on Myrobolan stock have been planted in land which previously carried apples. They have continued to grow better in sites treated in 1957 with Vapam, before planting, than in sites pre-treated with Nemagon. Each of these has given better trees than the non-treated sites. Vapam is both nematocidal and fungicidal, and Nemagon is nematocidal only. This suggests that the problem may involve more than nematode control. In this area, population of the parasitic nematode *Pratylenchus* sp. is at a high level.

In this experiment, D'Agen prunes on Buck plum stocks, planted in non-treated soil, have grown as well as the trees on Myrobolan in sites treated before planting with vapam. The vapam treatment has not had any influence on the growth of D'Agen on Buck plum.

The chemical treatments are expensive and, since Buck plum stocks are now commercially available, the practical answer to this problem on the evidence available is to plant trees on Buck plum stock.

In another experiment at Young, D'Agen prunes on Marianna stock have been planted in treated land recently cropped with prunes. The combined fungicidal and nematocidal action of a mixture of ethylene dibromide and chloropicrin applied as a pre-planting soil treatment is proving superior to treatment with the nematocide ethylene dibromide alone. Both are superior to no treatment.

Peach Crown Gall (*Agrobacterium tumefaciens*).—Experiments at each of two Sydney nurseries compared terramycin 200 p.p.m. with water, as a 30-minute dip for seedling stocks, at the time of rowing-out from the seed-beds.

The terramycin treatment had no signicant injury effect either on "hard" stocks or "green" stocks.

Level of crown gall infection in one experiment was too low for reliable results. In the other experiment, the trend of results favoured terramycin treatment. Overall percentage of crown gall infected trees was 0.6 per cent. in the terramycin treated, and 7.9 per cent. in the water-treated trees. These results have not yet been statistically analysed.

Cherry Bacterial Canker (*Pseudomonas syringae*).—A long-range experiment was set up at Orange, with the Division of Horticulture, to test the value of working susceptible cherry trees high on a resistant framework. Two resistant stocks are being tested, Deister and Malling F12/1. The trees were planted in the 1960 winter. They have done well in their first season. No bacterial canker infection has been seen.

Peach Bacterial Spot (*Xanthomonas pruni*).—The State-wide survey instituted last year has revealed this disease in 38 orchards, mostly at Orange. Cases have been recorded also at Bathurst, Darke's Forest and Wedderburn. The disease, favoured by the season, was more severe and widespread than usual on plums. It was recorded for the first time on apricots at Darke's Forest.

In laboratory assay experiments, to determine the anti-bacterial activity of certain chemicals which may be of field value against this disease, Agrimycin, Hibitane and Delan all showed some promise.

Growers at Bathurst and Orange who in 1960 applied the American programme of three 0.125 per cent. copper sulphate sprays, at fortnightly intervals during the leaf-fall period, gained no control of the disease.

Virus Diseases of Stone Fruit.—Buds from parent trees of *Prunus mahaleb* at Young and Orange were worked onto Mazzard seedlings and subjected to heat treatment for virus inactivation. Of all the trees which received heat therapy the *P. mahaleb* buds survived in only three. These and three non-treated trees will be kept under observation for virus symptoms next season.

The Deciduous Fruit Tree Improvement Committee again arranged for a State-wide survey of orchards and nurseries. As a result, a new disease (peach-calico) was recorded on Halehaven peaches at Orange. The Committee continued the inspection of nurseryman's sources of propagating wood, and suitable alternative sources were recommended in some cases. Propagating wood of a comprehensive range of varieties is now available from a limited number of trees, inspected, recorded and marked—as free from visible virus symptoms and true to type.

A supply of peach seed was obtained, and the seedlings will be used to determine the presence or absence of viruses in certain stone fruits. Also, indicator plants for stone fruit viruses were obtained from Melbourne and Adelaide. These indicator plants should enable an accurate identification of virus diseases present in stone fruits in New South Wales.

Diseases of Tropical Fruits

Banana Leaf Spot (*Cercospora musae*).—Good control is still being obtained by application of mineral oil, using portable misting machines, at three-week intervals from early January until the end of May. It is increasing in popularity with growers. No cumulative ill-effect of several seasons application of oil has been noted.

Banana Leaf Speckle (*cause undetermined*).—The experimental programme of misting with semi-concentrate fungicides has been continued. Promising results, not yet fully assessed, have been obtained. If successful, it is not sure that growers on difficult terrain will accept the method.

Banana Root Rot.—The burrowing nematode *Radopholus similis* is now accepted as primary cause of this disease. Injuries caused by the nematode are invaded by soil inhabiting fungi, particularly *Rhizoctonia* sp. and *Fusarium* sp. These bring about the final rotting of the roots.

The strain of *R. similis* attacking bananas on the north coast of New South Wales does not attack citrus roots. The nematode does not occur in virgin land. Banana setts transfer it from infested to uninfested land.

Heat inactiviation tests have shown that *Radopholus* can be destroyed in banana setts held in water at 50° C. for 20 minutes, without serious injury to the plant.

A large, mechanised, constant-temperature thermal inactivation tank has been constructed wth generous co-operation from the Banana Growers' Federation and the Colonial Sugar Refining Company. It is in use on a commercial scale, and banana plants free of the nematode are being established in virgin country. Division of Horticulture officers are supervising this activity.

Technical details of this research have been prepared for publication in *Nematologia.*

Banana Bunchy Top (*virus*).—Only 1,475 plants affected with bunchy top were detected in a total planting of 28,936 acres. (For further detail see Division of Horticulture section of this Report.) Despite this low overall incidence as a result of the continued campaign, complete eradication is not possible under the present system—detection of affected plants by inspectors and their destruction.

Passionfruit Fusarium Wilt.—Work is in progress at the Citrus Experiment Station, Narara, and Gosford, in co-operation with Division of Horticulture, to:—(i) select suitable disease-resistant rootstock for passion vines, (ii) develop an acceptable, resistant hybrid.

(i) Field trials under commercial conditions in badly-infected land at Kulnura have so far shown *Passiflora edulis* f. *flavicarpa* to be a highly-successful stock. Practically no loss has occurred, and the two years cropping history of the grafted vines has been excellent.

In spite of the yellow passionfruit's susceptibility to cold, the common passionfruit when grafted on this stock proved to be as resistant to cold as the seedling passion vines normally planted in this locality.

(ii) Progress has been made in selecting and testing hybrids, for resistance and desirable field characters. Back-crossing of a number of selections on to the common black passionfruit is intended in the coming season.

Diseases of Grapevines

Downy Mildew (*Plasmopara viticola*).—In collaboration with Division of Horticulture, high and low-volume sprays were compared:—Bordeaux mixture 5-5-100, copper oxychloride 1 lb./40 gallons, zineb 1 lb./40 gallons, and copper oxychloride ½ lb. plus zineb ½ lb./40 gallons. Incidence of downy mildew was only moderate and all sprays gave control of the disease. Bordeaux mixture high volume was rated the best, followed by zineb, high and low volume.

Dead Arm.—In collaboration with Division of Horticulture, sodium arsenite and phenyl mercuric chloride were compared; but incidence was very low, and no assessment of control was possible.

Doradillo Decline.—Affected vines in the Murrumbidgee Irrigation Area, Corowa, Tocumwal and Coomealla were surveyed. Samples of soil were tested for the presence of *Phytophthora* spp., with negative results.

Diseases of Ornamentals

Phytophthora Root and Crown Rot.—This affected young gerberas and chrysanthemums and a nursery planting of cypress. The *Phytophthora* was also suspected as cause of death in cypress specimens from home gardens. Varieties of cypress said to be resistant to this fungus in America were recommended as replacements.

Powdery Mildews.—These were recorded on chrysanthemum, gerbera, hydrangea, rose, zinnia and crepe myrtle.

White Rust (*Albugo* sp.)—It was particularly noticeable in the summer months on Gerbera; in the metropolitan area and coastal districts north to Murwillumbah. Spray trials next summer will attempt to determine an effective control.

Basal Brown Rot and Yellows (*Fusarium oxysporum* f. *gladioli*).—These were the most commonly observed diseases of gladioli. They occurred mainly in stored corms. High summer temperatures in the respective district favoured development of the diseases.

Rose Wilt (*Virus*).—This was again evident although warm temperatures masked autumn symptoms. Investigations are under way to determine mode of transmission, and to differentiate between this virus disease, and *Verticillium* wilt.

Black Spot (*Diplocarpon rosae*).—It was very prevalent on roses in the metropolitan area. Copper or dithiocarbamate sprays gave adequate control when applied promptly. Unsprayed plants showed cracking of the stems in addition to defoliation.

Oleander Bacterial Canker or *"Knot"* (*Pseudomonas savastanoi*).—This was common in metropolitan private gardens and other parts of the State. Removal of galls, use of copper sprays, and sterilization of secateurs when pruning, were recommended to prevent further spread of this disease.

Chlorosis (*Iron deficiency*).—This was the most commonly obesrved disorder of azaleas and occurred in widely scattered areas of the State. It was also seen in camellia, rhododendron, gardenia, kalmia and possibly chrysanthemum. Soil application of iron chelates was the recommended corrective.

BACTERIOLOGY SECTION

Dairy Products Bacteriology

Cheese Starters.—Supplies of freeze-dried lactic cheese starters were maintained for distribution to cheese factories; 940 cultures were supplied, 12.5 per cent. less than in 1959-60. The reduction was due in part to better care and maintenance of starters by dairy factory personnel.

Very low incidence of starter failures was reported to the Bacteriology Section, compared with previous years; and availability of the new starters (mentioned in last year's report) meant that improved alternative rotations could be devised in cases of emergency.

Cheese Quality Survey.—Foreshadowed in the report for 1959-60, a more comprehensive survey was done this year. Cheese from all major factories in New South Wales was sampled. The results showed that while pasteurisation at 162°F for fifteen seconds did not completely free cheese from staphylococci it did markedly reduce the level of contamination.

Survival Time of Staphylococcus aureus in Cheddar Cheese.—Further work was done. In the first experiment, where the cheese had an initial level of 41 x 10^3/g, it was free from staphyloccocci after ten weeks. It has been found later that survival of this organism is very good in low acid cheese. At pH 5.8 and after fourteen weeks curing, only a tenfold drop in numbers had occurred. More investigations in this field are planned for 1961-62.

Butter Quality Survey.—An organised butter survey was not carried out this year, but thirty-one samples were analysed for factories when special troubles occurred. A further survey is planned for 1961-62. By then the recommendations arising from the 1959-60 survey will have had time to be implemented.

Bacteriological Surveys.—Three complete factory surveys were done. Several other factories, including dairy and food condiment factories, were visited in an advisory capacity.

Extension Services in Dairy Products Bacteriology.—A lecture was given for the Agricultural Bureau at Moree, and another to the combined meeting of the Australian Society of Dairy Technology and the Australian Institute of Dairy Factory Managers and Secretaries. An intensive week of training in biology was given to dairy factory apprentices at Newcastle. A further two weeks course in bacteriology was given to the Dairy Technology and Food Technology students at Hawkesbury Agricultural College.

Nitrogen Fixing Bacteria

Distribution of Legume Inoculants.—Preparation of agar *Rhizobium* cultures for Experiment Farms, District agronomists, Branch Experiments and the Soil Conservation Service was continued; 629 cultures were despatched.

The Strains Collection.—This was maintained and two new strains were added.

Field Testing of Strains.—As a result of last year's field testing, NA39 has now become one of the two commercial medic strains.

Field testing of strains for the clover and medic group was undertaken at Grafton and Cowra, and supplementary laboratory trials were carried out. Preliminary results suggest that no change will be made to the present strain recommendations for commercial production.

Service Investigations.—A number of investigations were done in connection with service and advisory work. The more important results from these included the following: a proprietary protein extract material, recommended by the manufacturer as a sticking material in the preparation of inoculated lime pelleted seed, had a toxic effect on rhizobia when used at the recommended concentration; gypsum, applied as a pellet on inoculated clover seed, had no adverse effect on survival of inoculum (this investigation was for field workers studying the effect of gypsum pellets on establishment of clover seedlings on heavy, caking soils in the irrigation area); samples of the various brands of fertiziler used on the north coast for vetch establishment were found to have no undue killing effect on vetch inoculum (the cause of wide spread nodulation failure in vetches on the north coast remains undetermined).

Testing Commercial Legume Inoculants.—Results of the 3rd survey of the quality of commercial peat cultures on sale in New South Wales (initiation of this survey was mentioned in last year's report) have been finalised; 124 cultures were tested and all were satisfactory.

In 1958, 16 per cent. of cultures were unsatisfactory; in 1959, 2.4 per cent. were unsatisfactory; and now it would appear that culture quality is of a high standard.

The surveys have materially assisted in this improvement. They have provided the basis for extension advice on the need for better handling of cultures during distribution and the value of such advice has been clearly demonstrated.

A 4th survey has commenced, and preliminary results indicate that the improved standard has been maintained.

Testing of vetch cultures has been included in the present survey. Test-tube grown vetch plants have been used as the test host material, with satisfactory results. Further work on the use of tube grown plants for the assay of vetch and other large-seeded legume inoculants has been planned, because the present glasshouse methods are cumbersome and space/time consuming.

Isolation of New Cowpea Strain.—A collection of isolates from the cowpea (*Vigna sinensis*) is being made, to find a fast-growing strain. The present commercial cowpea strain is slow-growing, and thus liable to contamination during the long incubation period required to produce broths of standard count.

Rhizobium Relationships of Summer Legumes.—Little further work has been done during this year. At this stage the changing agronomic evaluation of the various species makes the value of the work very difficult to judge.

Industrial Bacteriology

Work in this field has been purely advisory. Four inquiries from firms (excluding dairying firms) in the fermentation and food industry were dealt with.

Diseases of Bees

Specimens for Diagnosis.—A total of 188 specimens was received for diagnosis of disease of bees; 161 of these were escorts imported with queen bees. These were examined for Nosema disease, and ten were positive. The queens accompanied by diseased escorts were destroyed. Twenty-one samples of adult bees from private beekeepers were examined for Nosema disease; eight positive cases were detected.

Six samples of brood comb were received; two were affected by American Foul Brood, one showed Pseudo-European Foul Brood, and three were undetermined.

Brood Diseases Confusion.—At present there is some confusion between European Foul Brood and a disease described in Victoria as Victorian Brood Disease. An attempt to clarify the situation is being made in collaboration with the Victorian workers.

Entomology Branch

The following matters occupied the attention of officers of this Branch during the year:—

PASTURE AND FIELD CROP PESTS

Incidence of Australian Plague Locust (*Chortoicetes terminifera*).—Its activity was greatly reduced by comparison with 1959-60. The first generation was confined to light hatchings, loose and scattered fliers in the Condobolin, Coonabarabran, Coonamble, Dubbo, Forbes, Hay, Narrandera and Narrabri districts. Local concentrations in Condobolin districts required treatment.

However, in the Coonamble and Narrabri districts, a considerable build-up of numbers occurred in the second and very late third locust generations. Extensive loose flying swarms were still present at the beginning of June, 1961, in these areas, apparently due to the prevailing mild conditions during Apri and May.

Insecticide-resistance Research

Research by an officer of the Entomology Branch, into the developed resistance of sheep blowfly to certain insecticides is producing genetic and treatment information of world-wide interest and practical value.

Considerable spraying was done in both districts between January and May although the scattered nature of much of the population allowed large numbers to escape treatment Many eggs have been laid and represent a threat for the spring of 1961.

This build-up in population was evident in the Patrol Officer's assessments of the season in the Bogan-Macquarie Outbreak Area. The bulk of the increase occurred in the north-eastern quarter of the area, and part of the Coonabarabran district was invaded by light swarms from Coonamble during and after February, 1961.

Other areas that reported increased numbers in the autumn were: Narrandera, where an extensive scattered population had been present for most of the season; Tamworth (near Gunnedah), where small amounts of insecticide were required during May to protect young wheat crops; and Warialda, where a few hatchings were reported.

These population increases all resulted from multiplication and aggregation of the local scattered population, mostly adult. whereas in the Moulamein district extensive scattered fliers with isolated small swarms appeared during January. Their point of origin is not known.

Correlation of Locust Plague and Weather Information from Records of 30 Years.—This work, including the mapping of the course of past outbreaks, was continued and intensified. Information has been gathered from many sources, including files, reports, personal letters, published data and newspaper reports for the period 1930-60. The infestation level for a number of outbreak areas has been indexed in an arbitrary fashion. Discernibly different grades of infestation have been given a numerical rating, ranging from one to five.

To determine any correlation between rainfall and the locust infestation index, rainfall monthly records were obtained for a large number of rainfall stations in New South Wales for the period 1920-60. Rainfall stations were so selected to provide an adequate coverage of each area, and the rainfall for each year was divided into early summer (August-December), late summer (January-April), and annual totals.

Most of these data have been tabulated and summarised and the locust infestation levels indexed, but further information is being sought on rainfall conditions in the far-western outbreak areas and on temperature conditions in all areas.

Both current and previous rainfall are beng considered in relation to locust numbers. To do this the rainfall patterns in (*a*) locust "increase" years and (*b*) locust "decrease" years have been compared.

Examination of the figures by means of Contingency Tables indicates that there is a negative correlation between the rainfall in the early summer period and locust population in the following season. Thus, dry early summer tends to favour locust increases in the following season. The converse is also true. Rainfall of the late summer period appears to have little bearing on long-term locust fluctuations.

Rainfall in the early summer period has been further compared with the locust infestation index by means of regression analysis. A straight-line relationship is evident. This relationship appears to be similar in all the outbreak areas so far studied, despite the wide differences between the areas in actual rainfall at different times of the year.

By incorporating factors other than rainfall and using a multiple regression technique it is hoped to arrive at a mathematical prediction for future outbreaks, with a reasonable degree of accuracy.

The Locust Information Service.—This worked well. Regular monthly reports from Pastures Protection Boards in the main provided adequate and reliable information. The patrol service also provided valuable reports and observations on population fluctuations in the Bogan-Macquarie area.

The Information Service has improved greatly since its inception and is believed to be the only real way of keeping track of early, small (yet significant) locust movements. It would be an invaluable service if it could be applied more widely, to other major outbreak areas in this and neighbouring States.

Assessment of Locust Phase Status.—This assessment by measurement of the tegmen-femur ratios from field-collected locusts was continued. Good series were obtained from the Condobolin district in November, 1960, and the Coonamble district in February and May, 1961.

As indicated in previous reports, it is intended to relate phase status to types of swarms encountered and the particular stage of the outbreak cycle reached. Where possible, series have been collected from successive locust generations. These have been mounted, and await measurement.

Incidental information of some value, such as percentage of parasitism and species involved, is also being gathered from the large series of locusts that have already been collected.

Wingless Grasshopper (Phaulacridium vittatum).—Reports of damage to pasture by *Phaulacridium vittatum* led to a visit to the Yass district in November, 1960. It had been thought that some effective control method might be used during the brief period when the hoppers tend to contract into recognisable swarm units. Generally this would be in November or December, as green herbage becomes localised to the more-favoured areas. However, good rains on the southern tablelands in the spring had allowed a widespread heavy growth of green feed. So, no tendency by the hoppers to aggregate was seen.

However, in February, 1961, many reports (mainly from the southern tablelands and slopes) indicated that the hopper was beginning to cause trouble in pastures, crops, gardens and orchards—rather later this season than in some previous years. These reports of damage followed a dry spell in January, 1961.

Preliminary insecticide trials were commenced near Cooma during March, 1961. Spraying of native pasture oversown with subterranean clover was done in rough, hilly terrain. The hopper population was in the region of 70,000—120,000 per acre and seven insecticides were compared in quarter acre, unreplicated plots.

Aldrin and dieldrin at 4 oz. per acre gave outstanding control, BHC at 3½ oz. and lebaycid at 6 oz. per acre were also effective; whereas sevin at 6 oz. and diazinon at 4 oz. per acre gave only a partial reduction of the population, and thiodan at 6 oz. per acre appeared to have little effect. Sevin was considered to be worthy of further trial at high dosage rates because of its low mammalian toxicity and its rather slow action on the hoppers.

Inspection of the area sixteen days after treatment revealed that all the effective insecticides had a useful degree of residual activity and had largely prevented movement-in of hoppers from surrounding untreated pasture.

Thus, several very efficient insecticides appear to be available. Main problems to be overcome appear to be in methods of application, timing of treatment, and assessment of the pest status of the insect in pastures.

Yellow-winged Locust (Gastrimargus musicus).— This locust, thought to be of little importance as a pest in the area, was seen in very large numbers and apparently a cause of severe damage in the Cooma and Yass districts. An observation made a few miles south of Cooma indicated the numbers present. A steady stream of adult locusts (not in a swarm) was observed flying across a road in undulating, treeless country. From counts made of locusts flying across measured lengths of road in a given time it was estimated that roughly 70,000 locusts per hour were crossing a mile of road. This flight lasted for a considerable period and was observed over many miles of the area traversed.

Spur Throated Locust (Austracris guttulosa and *A. proxima)*.—Unlike the previous season, when extensive damage occurred to wheat in some districts and relatively high locust numbers were observed over wide areas, only a single report was received during 1960-61. This referred to small numbers observed in the Tamworth district. Elsewhere the insect apparently occurred in very low numbers.

Studies of Black Soil Scarab (Othnonius batesii).—New areas of infestation recorded since 1959-60 were at Premer, Breeza, Wee Waa, Myall Vale, Narrabri and Mullaley.

There has been a marked rise over the last six months in most of the black soil scarab populations being sampled. Many new areas or patches are noticeable in native pastures, and many of the older patches are enlarging. Favourable soil moisture conditions were experienced at the "critical" period and are credited with this rise in populations. The "critical" period is the time between egg hatch and entrance of the larvae to the second instar stage. If the soil should rapidly dry out in this period, there is a high mortality of young instars.

Life-history studies continued. Attempts to rear larvae from eggs through to pre-pupae have failed. Further studies on the behaviour of adult beetles were completed. Another attempt was made to determine the factor or factors controlling the daily flight pattern.

Some of the factors influencing distribution and abundance of black soil scarab were looked at in more detail.

In an experimental attempt to determine the preferences of these beetles for particular soil types, female beetles were presented with a choice of five soils: a Graman black earth, an Oakwood black earth, a euchrozen, a yellow podsolic (Graman), and a lateritic kraznozen. They were arranged at random. Each lot measured 2 ft. x 2 ft. x 1.5 ft. The partitions were fibro sheeting.

Females were collected after a fall of rain late in February, 1961. One female were placed in the centre of each plot. Once placed on the soil surface they were free to move over the whole area.

The results in summary were:—Nineteen of the twenty-five chose the black earths, three chose the lateritic kraznozen, two the euchrozen and one the podsolic.

Whilst the decided preference for the black earths cannot be explained with certainty, it appears to be a purely mechanical reason. Surface soil of the black earths has a strong blocky pedal structure, and as they dry out after rain they crack extensively. Through these cracks the females were able to gain entry into the soil.

Progress of Control Measures for Black Soil Scarab.—A further ten control trials were set up. Some results from the insecticide trials were promising.

DDT is still exerting an influence on grub numbers, but there is a time lag before any effect becomes apparent. This suggests that early instar larvae are killed by the insecticide whereas third instar larvae are relatively "resistant".

Parathion at a fairly low rate of application (2 lb. a.i/acre) looks most promising as a material which allows establishment of pasture species. It is thought that lower application rates of parathion could be employed in this regard.

Pruinose Scarab (Sericesthis pruinosa).—Severe pasture damage by larvae of this beetle occurred in many parts of the northern, central and southern tablelands. Extensive areas of grass sward could literally be "rolled up like a mat".

Preliminary observations were made on the habits of *Sericesthis pruinosa* adults at North Dorrigo. Observations were made on the relationship between soil type and abundance of different scarab species. The build-up of Scarabaeid populations following on pasture improvement was studied.

To study the relationship between soil pH and larval densities a trial was laid down at North Dorrigo in May, 1961.

Three control trials, one ecological and two chemical, have been laid down during the past year.

During a survey of "Chiswick" Research Station in May, 1960 *S. pruinosa* larvae were abundant in a soil mapped as "grey ironstone", whereas they were missing from atypical black earths (no calcium) and weisenbodens. Very light and scattered infestations were found in yellow podzolics and chocolate soils. In areas where atypical black earths and grey ironstone soils were present side by side, *S. pruinosa* larvae were only in the grey ironstone soils. Sown pastures on this soil type were usually badly damaged by larvae. Whether this soil type is preferentially selected by gravid females is not known.

The relationship, if any, between Scarbaeid population, soil type and soil moisture is to be looked at in some detail over the next few years. A preliminary survey of the Dorrigo-Ebor area was made during the last week in November, 1960, when different soil associations were examined and soil insects collected.

Underground Grass Grub (Oncopera sp.).—Heavy infestations of *Oncopera* sp. larvae were seen in many localities in the Ebor-Dorrigo area in the spring and early summer of 1960. Improved pastures in some areas were completely eaten out. These proved to be pastures that had been locked up during late summer and early autumn because of the risk of bloat. They comprised cocksfoot and red and white clover. *Oncopera* larvae were also found in all native pastures examined, but in much lower numbers.

Soil type appears to exert little influence, but higher populations and greater damage were apparent where superphosphate 8 cwt. per acre had been applied.

Clover Root Weevil (Amnemus quadrituberculatus).—*Amnemus* activity was pronounced in the Richmond-Tweed districts, on a scale similar to past experiences.

Larvae were prevalent in all localities during the winter and early spring of 1960 and marked damage occurred in clover pastures, especially in spring when drought prevailed. Adult weevils were more numerous than previously recorded in summer, and in one unprecedented infestation in ladino clover at Uki some 2,700 weevils were collected in one hour.

Larval emergence occurred earlier than usual in 1961 in some Richmond-Tweed localities, and advanced larvae were observed in February and March. There is evidence that a second generation develops under these circumstances.

Adult weevils were recorded causing severe damage to lucerne foliage at Paterson (Hunter River) in May. This occurrence is especially interesting. A survey four years ago by Departmental entomologists failed to find this pest in the Hunter Valley although there were scanty records of its occurrence on the Hunter and Williams Rivers. It is unusual to find weevils in such large numbers as to cause appreciable damage by feeding on the foliage.

During 1960 another species of *Amnemus* was found in several clover pastures in the Kyogle-Casino district. The species is similar morphologically to *quadrituberculatus* in both adult and larval stages, but the adult weevil is somewhat smaller than *quadrituberculatus* and bears an additional pair of spines on the elytra. The species occur together and are jointly responsible for damage to clover. Specimens of the new species have been forwarded to the British Museum for identification.

Control of Amnemus by Dieldrin.—Very satisfactory control of *Amnemus* was obtained during the year, and control recommendations were issued early in 1961. In an extensive series of field control experiments in conjunction with the University of Sydney, effective control was achieved with various dosages of dieldrin.

Dieldrin, at all levels under test, caused significant reductions in larval numbers, statistical analysis showing that:—

Control $<\frac{1}{2}$ lb. a.i. dieldrin <1 lb. $=$ 1 lb. dust
<2 lb. <4 lb. at 5 per cent. level.

Near eradication was achieved with the higher dosages of dieldrin and very satisfactory control with 1 lb. a.i. per acre. Dieldrin dust formulations of 1 lb. a.i. per acre in superphosphate gave effective control and were probably slightly superior to similar strength spray treatments.

The limited testing of heptachlor suggested this insecticide was inferior to dieldrin except at higher dosage rates which were comparable with lower dosage rates of dieldrin. Only spray formulations of heptachlor were tested, so further assessment using dust formulations or granules may be warranted.

Throughout the experimental programme the greatest problem in assessing insecticides lay with longevity of the clover pastures. The significant reductions in larval numbers in dieldrin plots were not reflected in marked improvement in the density of ladino clover as between untreated and treated plots.

Usually, a general thinning out of clover occurred in late summer and autumn. Subsequently, fairly clear differences in clover density were evident between untreated and treated plots. This reflected effective *Amnemus* control, but in already depleted stands.

The causes of the initial depletion of clover can only be speculative, but may include such management factors as seedbed preparation, and grass control after establishment, as well as past and current *Amnemus* injury, other insect injury, plant diseases and nematode damage.

The current investigational programme is directed towards an assessment of the influence of *Amnemus* control on yield of ladino and subterranean clover.

Pasture Cockchafer (*Aphodius tasmaniae*).—An investigation commenced on a property in the Orange district is a study of the effect on scarab infestation of ripping a subterranean clover dominant pasture in summer—prior to oviposition by the pest.

Strips 20-30 yards wide were scarified in early February, 1961. Alternate strips of the same width were left untreated for comparison. The working was done 2-3 weeks before any large flight of the pest occurred.

Following rain in early June, the pest became very active and preliminary counts indicate that the treatment has been most effective in preventing infestation. Further observations will be made this winter; but it appears probable that the scarifying of clover-dominant pasture at the appropriate time will be proven valuable in control of pasture scarab as well as from the pasture management viewpoint.

Satisfactory control is obtained using 2 oz. and 4 oz. lindane or gamma BHC per acre (the 2 oz. rate early in the season) and no further work on insecticidal control seems necessary at present.

White Fringed Weevil (*Pantomorus leucoloma*).—Incidence of *Pantomorus* appears to be increasing throughout the Inverell district, but it has been found in association with *Amnemus* in pastures in the Lismore district. In the Taree district, many farmers have adopted the practice of treating their pastures with aldrin, and the use of this insecticide prior to the sowing of lucerne is increasing. Larvae damaged potato tubers in the Guyra and Armidale districts. This damage was noted in April.

In the spring of 1960, larval counts were made in Cowra plots which had been soil-treated with aldrin and dieldrin 1 lb. and 2 lb. per acre (some in February, 1959, and the remainder in August, 1959), prior to sowing with lucerne. Infestation in untreated check areas was very light, averaging only 1.3 per square foot in one plot and 0.3 per square foot in another, and the population in treated plots was virtually nil.

In a further experiment at Cowra, in which insecticide applications were made to an infested lucerne stand in early February, 1960, counts of larvae were made in August, 1960. Grub numbers averaged 1.71 per square foot in an area treated with dieldrin 2 lb. per acre, sprayed on and scarified in, 0.75 per sq. ft. in an area treated with heptachlor 2 lb. per acre, dropped on in a superphosphate mixture and scarified in, and 2.62 in an untreated area.

In a small adjacent area, sprayed three times with dieldrin 0.03 per cent. (on 4th February, 22nd February and 1st April, 1960), there were 1.3 grubs per square foot in August, 1960.

Further larval counts will be made in these two experiments at Cowra in the early spring of 1961.

Heliothis Caterpillar (*Heliothis punctigera*).—Heavy and widespread infestation of linseed crops in the north-west occurred during September-October, 1960. Damage was serious in some cases. Many reports of failure of DDT to control infestations were received. This may have been due to prolonged egg-laying by the moths.

A field trial was carried out during October, 1960, against larval populations of *H. punctigera* infesting a lucerne crop at Graman. In all, eleven materials were screened.

The results indicated that good control may still be obtained with 1 lb. of actual DDT per acre. Thiodan and sevin at the same rate of application showed promise as alternate control materials. Lindane, aldrin, lebaycid, phosdrin and dipterex were not promising.

Bloodworms (*Chironomidae*).—Damage to rice crops was noted in the Murrumbidgee Irrigation Areas during the spring, following attack by bloodworms. Roots were eaten and plants lacked vigour. They were detached by continued winds and floated away. Most growers now apply DDT or dieldrin in the irrigation water as a protective measure so damage was not extensive.

The damage was replicated in the laboratory. There the roots were chewed, and the seed was entered and eaten out.

Tests were run on samples of water taken from bays treated at the inlet with DDT miscible oil—dripped in at the rate of 1 gallon (of 25 per cent.) to 12 acres. Excellent kill was obtained with water taken 100 yards from the inlet and eight inches deep.

Floating pan traps have been developed, to sample adult populations, and inverted funnel-type traps are being used successfully to study the life cycle of the midge.

Eggs hang from the surface of the water in the form of a spiral coil to an inch depth. They hatch within 36 hours at spring temperatures. The complete cycle from egg to adult can be completed within seven weeks.

Wheat Root Grub (*Anodontonyx noxious*).—Very little activity by this pest was reported. No report of damage was received from Tamworth district. The first reports came in August, from the Wagga and Leeton agronomists. Each reported minor damage in a few crops.

The sowing treatments trial established in wheat at Duri on 19th May, 1960, was harvested and grain yields of the different treatments were measured. Discernible grub damage within the crop was never enough to see visual differences between treatments whilst the crop was growing. Nevertheless, the "fertilizer + insecticide" treatments gave yields up to 23.2 bushels per acre compared with yields as low as 16 bushels per acre for "no fertilizer, no insecticide" treatments. "Insecticide only" (the insecticidal powders were mixed with the seed) gave intermediate yields. "Fertilizer only" yielded only slightly better than "no fertilizer, no insecticide".

Wheatgrowers' Adopt the Root Grub Treatment.—The reported sales of aldrin and dieldrin at Tamworth indicated that district wheat growers had treated approximately 15,000 acres with insecticide-fertilizer mixtures at the 1960 sowings, for the prevention of grub attack. This was at least five times the area treated in the previous year. The increase is attributed to the Regional press and radio publicity.

Lucerne Seed Wasp (*Bruchophagus gibbus*).—Seed samples harvested from plots treated in a small-scale experiment at Spring Ridge in March, 1960, were held over to the spring for wasp emergence. No differences could be found between emergencies from seed from plots treated with rogor, dipterex or fluoracetamide, compared with seed from untreated plots.

Trials at Yanco on small plots of Hairy Peruvian Lucerne suggest that lebaycid is an insecticide worthy of further test against lucerne seed wasp. Other materials tested were phosdrin and BHC.

COTTON PESTS

Rough Bollworm (*Earias huegeli*) and *Bollworm* (*Heliothis* sp).—Further collections of cotton insects were made at Narrabri Experiment Farm in September, December, 1960, and January and April, 1961. In the December and January visits a new stem-boring caterpillar was noted. Attempts to breed it through have failed.

Red spider has shown up in the cotton at Narrabri for the first time. By April, it had infested in patches within the crop. Affected plants developed a red pigment and appeared to lose vigour.

At Yanco a trial to compare DDT + endrin, thiodan, and sevin was commenced in February, 1961. Repeat treatments were applied as required. DDT + endrin has shown out best, with thiodan also reasonable. Sevin was not so good. The wettable powder may not have been a satisfactory formulation for use in a knapsack mister.

STORED PRODUCT PESTS

Rice Weevil (*Sitophilus sasakii*) *and Lesser Grain Borer* (*Rhyzopertha dominica*).—Laboratory investigations have been commenced, to determine the relative period of effectiveness of various low toxicity insecticides added to wheat—against these two primary pests of wheat in this State.

The progress report after two months is as follows:—

Malathion (10 ppm): 100 per cent. mortality of *Sitophilus* and 75 per cent. mortality of *Rhyzopertha.*

Pyrethrum-piperonyl butoxide (1.7 ppm and 27 ppm): 100 per cent. mortality of *Sitophilus,* 90 per cent. mortality of *Rhyzopertha.*

Bromodan at 50 ppm: 100 per cent. mortality of both species, but less satisfactory at 10 ppm.

Sevin (10 ppm): 100 per cent. mortality of *Rhyzopertha.*

Lindane (5 ppm) and methoxychol (10 ppm): not comparable with the other materials.

Work in the preceding year's stored wheat, in co-operation with Wm. Cooper and Nephews (Aust.) Pty. Ltd. and the Grain Elevators Board, showed the value of pyrethrum-piperonyl butoxide spray treatments as grain protectants.

During the period of storage (up to 9 months) complete protection of treated wheat in silo bins was given, so far as primary insects were concerned. Light populations of secondary (*Tribolium castaneum, Oryzaephilus surinamensis*) did occur in treated bins, but in untreated bins much heavier populations of secondary insects developed, and one bin was heavily infested with *Rhyzopertha.*

In the continued work this season, malathion was used as well as pyrethrins. The main treatments were at 250,000 bushel flat storages, one each treated at harvest with the respective insecticide.

As in the previous season the pyrethrum-piperonyl butoxide (pybuthrin) was applied at a theoretical rate of 1.7 ppm pyrethrins and 27 ppm piperonyl butoxide, malathion was applied at a theoretical rate of 11.95 ppm.

These two storages, and two storages in the same district which has no protective treatments, have been sampled at three-monthly intervals (one of the untreated storages was fumigated at harvest with phostoxin at approximately two tablets per ton).

At three months after harvest no living insect was found in either of the treated bins. Of the two other bins, that which had been phostoxin fumigated at harvest had low populations of secondary beetles and a high population of Psocids. The other was very heavily infested with *Tribolium* and *Oryzaephilus,* with a few *Rhyzopertha* at depths down to 15 feet.

At six months the malathion treatment still remained completely free of insects; in the Pybuthrin treatment low-surface populations of *Tribolium* had developed. The remaining untreated storage had become heavily infested with both *Sitophilus* and *Rhizopertha* as well as secondary beetles.

A series of surface treatments of both malathion and pybuthrin dusts following phostoxin fumigation has been carried out in a number of silo bins. Preliminary observations indicated that these are effective.

Adoption of Treatments by Grain Elevators Board.—Following these trials the Grain Elevators Board is proceeding with malathion treatment of all wheat as it enters terminal storages at Sydney and Newcastle.

Farm User Trials.—After last season's trials it was considered that a dust treatment should be more useful to farmers, because of ease of application. Farm-user trials were organised in premium wheat-growing areas in the north-west.

In these, flour-based malathion and pybuthrin dusts were added to the harvested wheat either in the header bin or at some other stage before the wheat entered the storage.

The malathion treatments have given nearly 100 per cent. protection in all cases, light populations of secondary beetles have again occurred in pybuthrin-treated bins.

Milling and Baking Trials of Malathion-treated Wheat.—These have been done at the Bread Research Institute. Wheat treated at the normal rate (12 ppm) and three times normal (36 ppm) was examined 16 days after treatment. The following is extracted from the Director's report:

> "Malathion does not appear to affect milling quality, the characteristics of flour milled from the wheat, the baking quality of this flour, or flavour of the resultant bread, at three times normal treatment. The smell of malathion persists in wheat treated at the normal level for over 14 days and is comparatively unnoticeable. In the dry offal the smell of the insecticide is not noticeable; when the offal is wet, only bran from three times normal treatment was picked as possessing an unusual smell. It may be concluded from this that the insecticide does not penetrate further than the bran within 14 days of treatment."

Maize Weevil (*Sitophilus oryzae*).—Trial work on the problem of this infestation of maize by the large strain of the rice weevil (*Sitophilus oryzae*) was begun last season at Kempsey. Trials of insecticides indicated little protection in the field, but some information on the conditions affecting infestation was obtained.

Those cobs in which the husk cover allowed the grain to be exposed were 40 per cent. more infested than those with sound husk cover. Cobs damaged by birds and, to a lesser degree, by other insects such as *Dichocrocis* and *Heliothis,* were especially susceptible.

From past records it would appear that the main varieties grown for hybrid maize on the north coast are approximately equally susceptible to attack.

A survey of a number of groups in the Kempsey area showed the value of late planting in reducing weevil attack in the field.

Skin and Hide Beetles (*Dermestes maculatus* and *Necrobia rufipes*).—In a trial to estimate the value of various organic insecticides compared with the standard arsenic treatment used in the industry for the protection of sheep skins, both dieldrin and diazinon at 0.5 per cent. gave excellent protection. This was under pressure of heavy populations of *Dermestes maculatus* and *Necrobia rufipes.*

These materials at 0.05 per cent. together with the arsenic treatment were not significantly more effective than the untreated control.

The cost for effective treatment with dieldrin or diazinon (0.5 per cent.) was approximately 0.2 pence per skin, compared with 0.02 pence per skin for arsenic.

FRUIT PESTS

Codling Moth (*Cydia pomonella*).—Measures now recommended are extremely effective and very little codling moth infestation occurred in commercial orchards. Experiments in the M.I.A. showed that satisfactory control could be obtained by spraying at three-week intervals with sevin 0.075 per cent., gusathion 0.025 per cent. or thiodan 0.066 per cent. Build-up of red spider was evident in the plots sprayed with sevin.

Red Spider (*Tetranychus telarius*).—Very heavy infestations of red spider developed in most pome and stone fruit districts, especially where sevin or DDT was used to control other pests such as fruit fly or codling moth. Results with different miticides varied between growers due mainly to organo-phosphorus resistance in mite populations, or to inadequate spraying. Considerable use was made of the non-phosphorus miticides tedion and kelthane, and generally results with them were satisfactory.

The most effective treatment in experiments at Orange was tedion 0.02 per cent. emulsion type. This treatment had little effect on adult spiders. It has to be applied before heavy spider populations develop on the trees.

Although a few adults were always present, the tedion 0.2 per cent. emulsion type, prevented any breeding on the trees for a period of eight weeks, and symptoms did not develop on any trees. Only one application was made, although a slight build-up occurred late in March, a second application was not warranted. Tedion, emulsion type, can be recommended to be applied at an early stage of spider infestation, with a second application eight weeks later.

Tedion 0.02 per cent. in wettable powder form was far less effective than the emulsifiable form. Spiders were always more numerous and symptoms developed in one tree. It prevented breeding on the trees for a period of six weeks, after which a second application was made. Initial application was made later than would be desirable in commercial practice.

The material may be recommended for use at an early stage of infestation with a second application six weeks later.

Kelthane 0.03 per cent. in wettable powder form gave excellent results, with rapid and complete kill of all active forms. It permitted re-infestation after six weeks. Then a second application was given. This prevented further infestation in the remainder of the eleven-weeks observation period.

In cases of organic-phosphate resistance and where rapid reduction of a considerable infestation is necessary, kelthane is the most effective material available.

Ethyl-Gusathion 0.05 per cent., normally very effective against this pest, gave unsatisfactory results. Existence of a measure of organic-phosphate resistance was quite apparent in the experiment block.

Bayer 4935 at 0.07 per cent. was quite effective, though not as good as kelthane. It gave rapid kill of all active stages, and prevented re-infestation for a period of five weeks. A second application, six weeks after initial treatment, prevented further infestation during the eleven-weeks observation period. However, the material caused a good deal of yellowing and subsequent drop of leaves. It would be unsuitable for use on Delicious apples.

HOE.2784 at 0.075 per cent. was not quite as effective as Bayer 4935. It gave rapid kill of all active stages, but permitted re-infestation within four-five weeks. It caused excessive leaf burn and drop. This would preclude its use on Delicious apples, at least.

DMC 0.03 per cent. and Bayer 4889 at 0.075 per cent. were found to be not sufficiently effective and were discarded.

Observations and experiments indicated the value of thorough spraying from the ground. Only thus could satisfactory control be obtained in dense trees.

Satisfactory materials exist for the control of red spider, but problems of spray application so as to secure adequate penetration of interiors of trees remain to be solved.

Three strains of red spider (*Tetranychus* sp.) from Orange were tested and found resistant to organo-phosphorus insecticides. A strain also from the Orange district, and susceptible at one-tenth of normal spraying strength, was used for comparison.

In the M.I.A., satisfactory control of red spider on peaches was obtained by single sprays of tedion 0.03 per cent. or kelthane 0.05 per cent, or with two sprays, at three-week intervals, of ethion 0.6 per cent, gusathion A 0.05 per cent., Bayer 4935 at 0.05 per cent. or HOE. 2784 at 0.05 per cent.

Woolly Ahpid (*Eriosoma langireum*).—At Orange lindane and endrin applied at green tip and spur burst, and certain systemic materials applied in late November, 1960, when the trees were in leaf, were compared. No infestation of new season's growth occurred until the end of November. The systemic treatments were applied just as infestation was commencing.

A rapid and fairly thorough kill was obtained within six days with metaisosystox 0.03 per cent. and ekatin 0.03 per cent., but sayfos was very slow to take effect.

Evaluation in early January, 1961, indicated the following order of decreasing effectiveness: Sayfos, 0.015 per cent. (applied on 30 November); lindane in superior oil—0.08 per cent. lindane (at green tip); metaisystox, 0.03 per cent. (on 30th November), and lindane emulsion 0.06 per cent. (at spurburst) (last two aeq.); ekatin, 0.03 per cent. (on 30th November); and endrin emulsion, 0.03 per cent. (at spurburst) (last two aeq.); endrin in superior oil—0.03 per cent. endrin (green tip); untreated.

Each treatment with the exception of sayfos, and possibly lindane 0.08 per cent., was disappointing. Too much re-infestation had occurred for the stage of the season.

In another experiment at Orange, four systemic materials were tested for control of woolly aphid in the growing period, where considerable infestation had occurred on the new season's growth. The materials were applied such as to achieve a complete all-over tree cover, but with no special attempt made to penetrate to the centre of the trees and achieve direct contact of infested growth. Applications were commenced in early February, 1961.

The four treatments were: Sayfos, 0.015 per cent., plus wetting agent; ekatin, 0.03 per cent.; phosdrin, 0.043 per cent. (of 60 per cent. product), plus wetting agent; metaisosystox, 0.03 per cent.

Phosdrin appeared the most effective treatment, ekatin and metaisosystox gave somewhat similar results, while sayfos, too slowly absorbed, was slow to take effect. It would be of limited value once a heavy infestation had developed.

Systematic materials represent a great advance in the control of woolly aphid during the growing period; such control is now feasible.

Cherry Aphid (*Myzus cerasi*).—Further work on the use of systemic materials against the pest early in the growing period confirmed the effectiveness of metaisosystox 0.02 per cent. and sayfos 0.01 per cent, although sayfos was absorbed very slowly and gave a very slow result. Both materials give excellent control of the pest when the trees are in leaf. They are a great advance on purely contact-type aphicides.

Ekatin 0.02 per cent. was considerably less effective than the above two materials.

Results with systemic materials in the past two seasons have indicated that their use soon after the trees come into leaf is a very satisfactory alternative to the use of contact type materials at budswell.

Grape Bud Mite (*Eriophyes vitis*).—Counts of fruitful buds on O'hanez grapevines showed the number could be increased from 30 per cent. to 50 per cent. by controlling the bud strain of this mite. Satisfactory results were obtained by spraying in the spring with parathion, phosdrin and tedion.

The trials were extended this year to incorporate safer materials in the test and to establish the optimum timing of the spray. Other grape varieties were also being investigated to establish whether bud mite is important also to them.

Peach Silver Mite (*Vasates cornutus*).—Preliminary observations and experiments were initiated to establish whether there is a link between infestations by the peach silver mite and the recurrent problem of bud-shedding of peaches in the M.I.A.

A technique to separate the mites from the buds has been developed. Populations of up to 800 per bud have been found. Trials have been put down using parathion or phosdrin. Results will be assessed in the spring of 1961.

Dried Fruit Beetle (*Carpophilus* spp.)—Field occurrence and control of dried fruit beetle in relation to peaches in the M.I.A. are now being investigated. Already, dieldrin soil treatments have shown to advantage.

Surveys have shown persistence of the beetle as adults and larvae in peach mummies; and as adults, larvae and pupae in the soil in late autumn. Dried fruit beetle is regarded as being of some importance to the incidence of brown rot of stone fruit.

Wheat-root Scarab Control

The scarab beetle root-pest of wheat and oat crops is being controlled in field experiments. The foreground plot is an aldrin treatment area. Above it is an untreated comparison plot ; and above that is a plot treated with diazinon.

Some life history studies have been commenced; and a laboratory breeding method has been established. In addition, regular weekly field collections of adults and larvae have been made from rotting apples in the Cumberland area. The numbers of adults collected in a constant time each week since autumn have remained approximately the same; and the ratio of the three as yet unidentified species regularly found has also remained constant.

Oriental Fruit Moth (*Cydia molesta*).—A series of experiments to find a satisfactory spray programme for the control of this and some other pests of peaches, were conducted in the Sydney metropolitan area in the 1960-61 spring and summer. Sufficient information was obtained to make recommendations for the control of *Cydia molesta* in the metropolitan area.

Control can be achieved by thorough cover spraying with one of the following insecticides: Gusathion at 0.05 per cent. concentration, sevin at 0.1 per cent, or lebaycid at 0.05 per cent.; applied every three weeks, commencing at the first sign of moth activity (about the end of September), and continuing until about three weeks before picking. Lower concentrations could be used but require further testing.

Other conclusions from these experiements were that the same programme gives good control of light brown apple moth; but, of the three incesticides only gusathion will effectively control red spider.

Citrus Gall Wasp (*Eurytoma fellis*).—Some extension of the area known to be infested was recorded. Infestations were noted as far west as Penrith in the County of Cumberland. A very small infestation was also found in a citrus orchard at Maroota. However, the main commercial citrus districts remain substantially free of gall wasp.

The dispersal pattern of adults was studied. Potted, uninfested Common lemon seedlings were placed at increasing distances from a central heavily infested tree. The results indicated that flight range is normally short. Infestation in the potted seedlings was not recorded beyond ten feet in any direction from the central source tree.

Observations on time and period of adult wasp emergence were continued. Majority of first emergences in the Sydney area occurred in the last week of October, and continued for an average period of three weeks. In some places wasp emergence may occur up to the end of December.

A very substantial increase in the recovery of gall wasp parasites in the Sydney district occurred this season. More than half the samples collected yielded parasites, often in very large numbers.

Three experiments on control were done in a glasshouse, using infested small citrus trees in earthenware pots.

Two of the experiments were screening trials. These aimed to test the effect of a number of systemic insecticides, by soil and spray applications, on gall development when applied to the trees at a time when all eggs had hatched but before any galls had developed. Results were assessed by gall counts and checked by wasp emergences.

Only gall counts have so far been made. These have shown, for the soil treatments, that dimecron, isolan, phosdrin, metaisosystox and ekatin completely prevented gall development; while the trees treated with sayfos, thimet (and the untreated control trees) had considerable numbers of galls. Fluoroacetamide was also in this trial, but it killed all the trees to which it was applied.

In the spray application experiment no result was obtained. Insufficient eggs had been deposited by the wasps when the trees were being infested. All of the above insecticides except thimet were tested. No spray damage occurred.

The third experiment on control was a comparison of different concentrations of fluoroacetamide applied as a spray. (Fluoroacetamide was chosen because it was the best of a number of insecticides tested the previous year.) The time of application was as in the other two experiments (3rd January, 1961).

Results were assessed by counting all galls per tree. The mean of each treatment (six replications) was: untreated—14.8 gallons; fluoroacetamide (0.025 per cent.)—9.5 gallons; fluoroacetamide (0.05) per cent)—7.0 gallons; fl. (0.1 per cent.)—7.0 gallons; and fl. (0.2 per cent.)—3.2 gallons. Statistical analysis of the results showed that the differences between treatments were not significant. These results will be checked by observing emergence of adult wasps next spring, as there had been some gall development before treatment.

Queensland Fruit Fly (*Dacus* (*Strumeta*) *tryoni*).—Reports from throughout New South Wales indicated relatively light loss of fruit during 1960-61. This is attributed in part to diminution of numbers during the 1960 winter, following a relatively light year in 1959-60; more widespread use of systemic insecticides in built-up areas; and increased fruit fly consciousness, with resultant more thorough treatment of larger areas.

Continued presence of fruit flies throughout the winter in inland areas was indicated by catches with male lures at Hillston, Narrandera, Bourke, Forbes, Menindie and Broken Hill. At Narrandera, where fly numbers had been high in the 1960 autumn, late stage maggots and empty pupal cases were found in late hanging quince fruits in late July. At Orange male flies were trapped from late August through to April.

Infestation of fruit during the summer and autumn was generally on a reduced scale; but was recorded, amongst other places, at Lake Cargelligo, West Wyalong, Bourke, Condobolin, Gilgandra, Cobar, Trangie, Parkes, Forbes, Hillston, Wagga and Albury. A small infestation reported in peaches at Batlow was a first record of fruit fly infestation there.

At Narrandera, where the 1960 autumn population of flies was known to be high and evidence of overwintering maggots had been obtained, an attempt to suppress infestation by using male lures and bait spraying was established. An eight-chains-square grid distribtuion of caneite pads, impregnated with one-fifth gram each of DMPH and malathion, was done for the town area in August, 1960; 189 traps were dispersed, at the rate of 122 per square mile. Regular bait spraying with malathion-protein hydrolysate was commenced in October and carried through the season. Similar bait spraying was carried out at Leeton and Griffith. At Hillston bait spraying did not commence until December.

No infested fruit was recorded at Narrandera throughout the season, nor was any recorded at Leeton or Griffith. Two male flies were caught at Narrandera, one at Leeton, and isolated catches took place from October to March at Griffith. Hillston yielded flies throughout the year, except in November, and fruit infestation occurred, but on a reduced scale compared with the previous year.

The Fruit-fly Male Attractant Experiment at Richmond-Windsor.—In co-operation with teams working from the C.S.I.R.O. and Union Carbide Australia Ltd. an experiment was commenced in the Richmond-Windsor area on 8th August, 1960, to estimate to some degree the fruit-fly control potential of an area-treatment using male-attractant lure.

Because of its relatively good "isolation" (surrounded by relatively bare large paddocks) the Richmond area was selected for the treatment, with the built-up town area of Windsor untreated to provide the comparison. The closest point of treatment to Windsor was about one mile west of that town.

Male-lure site positions at the rate of 250 lure sites per square mile, with 110-yard intervals on a square grid, were chosen. The nearest suitable natural fruit fly host (tree, shrub or vine) was chosen as a lure site in each case except along the Penrith road section. There, some lures were hung on fence posts or fence wire.

Superimposed on the 110-yard grid, a 330-yard square grid was used to define positions for observation lure placement, designed to provide equal attractance to males—caught stuck onto the surface of sticky polymerised butane. Forty-eight such lures were placed, to maintain weekly records of males attracted, and their disposition relative to the position of the other lures.

The 348 standard 4 in. x 3 in. blocks of cane-ite and the 48 sticky lures were dosed with 20 cc. of alcohol solution containing 1 gram each of l-p-acetoxyphenyl-3-butanone (also described as 4-p-acetoxyphenyl-2-butanone or as p-acetoxy benzyl acetone) and premium grade malathion.

Lure catches from 12th August to 9th September, 1960, were at a relatively high rate. Subsequently, until the 2nd December, lure catches gave low counts. From this point a general but not spectacular rise occurred until 20th January, 1961. After this, and until 9th March, the largest catches of the season were made. Declining peak catches then occurred from early to mid-April, and again from late May to early June,1961.

In all, 2,057 male flies were taken, stuck to the observation lures and removed weekly. Of this total, 14 per cent. were taken from 12th August, 1960 to 25th November, 1960, 7 per cent. from 2nd December, 1960 to 13th January, 1961, 69 per cent. from 20th January, 1961 to 20th April, 1961, and 10 per cent. from 27th April, 1961 to 30th June, 1961.

Some of the observation lures caught more than 100 male flies. These large catches are consistent with migrations of flies mainly from north and south of Richmond, at its peak during the period 20th January, 1961 to 20th April, 1961.

At intervals from 27th September, 1960 to 28th April, 1961, either Richmond or Windsor township was sampled in rotation—as to the content of their adult fruit fly populations. 3,368 flies in all were taken alive, and 1,948 of these were female flies—of which 1,844 were dissected. Windsor provided the greater number of flies of both sexes.

From the data it was seen that peaks in proportion of male flies sampled at Richmond followed those of Windsor, that peak luring of male flies to attractant lures in the Richmond area followed peaks in proportion of male adult flies sampled in the town, that the proportionate reduction in male flies at Richmond, very big into the spring, was again becoming big in winter, and that an overall reduction of about 50 per cent. potential adult males was effected in the town of Richmond.

The overall percentage of females dissected and found to have mature ovaries was 43 per cent., in the samples from both towns. The overall reduction of about 5 per cent. insemination at Richmond, compared with Windsor, was most obvious early in the spring. Again, the statisitcs for Richmond followed those at Windsor, peaks of insemination and mature females tended to follow peak proportions of males.

The percentage of mature females inseminated is considered to be of greatest importance as an indicator of the usefulness of this approach to control. Corresponding with the aforementioned statistics applying to the early part of the seasons, a considerably-reduced rate of insemination was found in the town of Richmond. A reduced percentage in favour of the town of Windsor from 17th March to 24th April is without explanation at present. An overall reduction of 12.5 per cent. insemination in favour of the town of Richmond was noted to 30th June, 1961.

In both towns, peaches were sampled at five intervals from the beginning to the end of the peach varieties. Each tree sample was retained in a separate polythene bag stored at room temperature, and each fruit was dissected and any maggot development recorded.

Data from this aspect of the work have been examined. Significant differences at the 5 per cent. level in infestation rate have been shown for the first two samplings, comprising early and early-midseasons peaches respectively.

It can be stated that the male-annihilation procedure applied to Richmond, as compared with Windsor, has resulted in encouraging practical indications, relative to early in the fruit season. Indications were that while the overwintering population in the Richmond area may have been substantial, males can be annihilated and kept at a low level until December, while a proportion of females unmated in early August can thus be denied sperm to such a degree as can, into December, save fruit. Then this procedure as used at Richmond has little further horticultural effect.

Town treatment in this way, preferably commenced in autumn, appears to be a promising proposition for discrete or isolated areas. In places such as Richmond the treatment could be a useful adjunct to conventional baiting over a large area.

Resulting from an experiment in a block of lemons at Warrawee, run from 8th November, 1960 to 10th January, 1961, and observed at five intervals, a total of 5,534 male flies were taken by the twelve lures used. 47 per cent. of the flies were lured to the old lures, compared with 53 per cent. to the new lures.

The naked (dry or non-sticky) lures, both new and old, accounted for 78 per cent. of the flies, compared with 21 per cent. lured to both new and old observation (or sticky) lures. Of this 21 per cent., only 9.4 per cent. of male flies were accounted for as attached to the sticky polymerised butane—while 12.1 per cent. were "lost" to trays beneath.

As 48 sticky lures in the Richmond area recorded 2,057 males flies from between 8th August, 1960, and 30th June, 1961, it is possible that 2.29 times as many were lured and annihilated, i.e., 4,711 flies.

In a further experiment in the block of lemons at Warrawee, the catching ability of the old traps during the first week of exposure was equal to that of new traps, but thereafter the old traps caught about half as many males as the new traps. This was largely due to a lessening of "loss" or drop, associated with the new condition of the latter.

At the one-gram level of attractant and each toxicant, five admixtures were tested at Glenorie between 9th May, 1960 and 1st February, 1961. Three commercial malthion preparations were tested as toxicants for male lures. Best results were obtained with the premium grade, 98.5 per cent. malathion, with which no additives were formulated. The luring and catching ability of admixtures of DDVP, with and without Araclor 1 : 4, was more than twice that of malathion. It is hoped that the experiment will yield further information as to the ageing effect of the admixtures.

Fruit-fly, Commodity (Citrus) Treatment Investigations.—These continued, in collaboration with Gosford Citrus Wastage Research Laboratory staff.

Routine two-hour fumigations at 50° F., using two EDB dosage levels (1½ lb. and 2 lb. EDB/1,000 cu. ft.) were completed during 1960, together with routine two-hour fumigations at 60° F. (using a dose of 1½ lb. EDB/1,000 cu. ft.). A complete summary of the results is given in the following table:—

Fruit Temperature	Dosage Rate (oz./1000 cu. ft.)	No. of fumigetions carried out	Larvae Killed	Larvae Surviving
70°F. or over	18	38	24,506	0
	16	111	60,785	3
60°F. ± 3°F.	24	28	39,136	0
50°F. ± 3°F.	32	49	25,232	0
	24	49	26,010	1

Ethylene di bromide movement into and out of the juice of fumigated oranges was studied in relation to storage temperature and time following fumigation. Comparisons were made between 1 lb. EDB/1,000 cu. ft. dosage at 70° F. and 1½ lb. EDB/1,000 cu. ft. dosage at 50 ° F. The samples were stored at both 70° F. and 50° F. following fumigation.

The results indicated that storage at 50° F. following fumigation led to the EDB level in the juice remaining near to its peak for at least 70 hours following fumigation. The EDB juice residual in the fruit stored at 70° F. gradually declined during the 70-hour sampling period.

Several trials indicated that EDB in the orange must be maintained at a suitable level for many hours after completion of fumigation, to obtain 100 per cent. mortality of Queensland Fruit Fly larvae. This work confirmed the point of view that fumigation is simply a method of putting EDB into the fruit.

In several sets of fumigation conditions studied, EDB residual in the whole orange had dropped to less than 10 ppm one week following fumigation.

Results of one trial indicated that the length of fumigation period was important in relation to juice EDB uptake. Fumigation periods of less than 2 hours gave appreciably lower juice uptake than a 2-hour fumigation, and a 3-hour fumigation gave increased EDB uptake.

Several preliminary trials have been carried out to examine the possibility of using EDB, emulsified in water, as a dip treatment. The results of these preliminary trials indicated that:

(*a*) Dips of two to 3 -minutes duration at concentrations of 6 to 10 g/litre would result in juice EDB uptakes that compared more than favourably with the standard fumigation.

(*b*) The length of dipping period was very important in relation to juice EDB uptake, and that an increase in both length of dip and concentration, results in a proportional increase in juice EDB uptake.

(*c*) The EDB was lost fairly rapidly from emulsion dips during agitation and standing, especially where the temperature of the dip solution was high.

(*d*) As with fumigation, there was variation in juice EDB uptake between various growers' lines of fruit.

Fruit-fly: Commodity (Banana) Treatment Investigations.—An experiment to provide a commodity treatment for bananas, to allow entry of treated bananas into fruit fly quarantine areas, was finalised—except for some aspects of Public Health requirements concerning rogor and lebaycid residues.

Dipping of bananas with 0.04 per cent. rogor or 0.05 per cent. lebaycid, one or two days after artificial infestation by fruit fly, completely inhibited egg development and the emergence of larvae. This fruit bore no trace of infestation when examined. Fruit dipped three to ten days after infestation contained dead larvae in various stages of maturity, dependent on the lapse of time between infestation and dipping. Complete mortality of larvae, or inhibition of larval emergence, was obtained in all tests.

Similar results were obtained with rogor-salicylanilide and lebaycid-salicylanilide mixtures and infested fruit, dipped in the laboratory and under commercial conditions in banana cases.

Tasting tests with bananas dipped in rogor and lebaycid, separately, proved satisfactory.

Lebaycid residue analysis carried out by the manufacturers of the insecticide suggested that there was no toxicity hazard associated with lebaycid-dipped bananas consumed eight to fourteen day after dipping. Rogor residue analyses are yet to be done, but have been arranged with the manufacturers.

Red Scale (Aonidiella aurantii).—A very considerable carry over of red scale into the summer season was evident in the M.I.A.; but the light Valencia crop was harvested early, and many growers applied sprays in November, 1960 and again in February, 1961, as recommended. This resulted in a general reduction in infestation compared with the previous season.

The project at Yanco, in co-operation with Merrindale Biological Research Station, was continued during the 1959-60 season simply as a screening trial. Single, February (1960) applications of white oil-organic phosphate combinations were used. Assessment of the results was done at a sampling in June and at a harvest examination in November, 1960.

Satisfactory results were obtained with trithion w.p. 0.05 per cent. plus white oil 1/100; dimethoate w.p. 0.1 per cent plus white oil 1/100; gusathion w.p. 0.5 per cent. plus white oil 1/100; ethion w.p. 0.05 per cent. plus white oil 1/100; malathion w.p. 0.1 per cent. plus white oil 1/100, and white oil 1/50.

Trithion and dimethoate were probably superior to the others. Methyl trithion w.p. 0.05 per cent. plus white oil 1/100 was not promising; and experimental compound PP.175 w.p. 0.04 per cent. plus white oil 1/100 was quite unsatisfactory. All white oil used was mayonnaise type.

The experiment was contained in the 1960-61 season, and the following double treatment schedules were applied:—

November, 1960	February, 1961
A. White oil 1/80	Ethion w.p. 0·05% + white oil 1/100.
B. White oil 1/80	Trithion w.p. 0·06% + white oil 1/100.
C. White oil 1/80	Rogor w.p. 0·05% + white oil 1/100.
D. Sevin w.p. 0·1% + white oil 1/100	Sevin w.p. 0·05% + white oil 1/100.
E. White oil 1/80	Trithion 0·06% + white oil 1/100*.
F. White oil 1/80	Malathion w.p. 0·1% + white oil 1/100.
G. White oil 1/80	"Silikill" 4-lb./100-gal. + white oil 1/100.
H. White oil 1/80	Trithion w.p. 0·03% + white oil 1/100.

* Rained immediately afterwards.

The first assessment on this trial was made at a sampling count in June, 1961. At this stage no special difference was apparent; except in the case of "Silikill" (not satisfactory).

White Wax Scale (Cereplastes destructor).—The record heat wave in January, 1960, drastically reduced white wax scale populations in many areas. Only limited control measures were necessary against this pest during the past season.

Citrus Rust Mite (Phyllocoptruta oleivora).—Some very heavy infestations of rust mite were reported in coastal areas from Newcastle northwards, but, in general, damage to central coast citrus trees was less than usual. This perhaps was due to the mild moist summer season.

Results were asessed in the trial commenced in January, 1960, on Valencia trees at Mangrove Mountain. The addition of zineb (0.07 per cent. w.p.), kelthane (0.05 per cent. w.p.), tedion (0.02 per cent w.p.) or trithion (0.06 per cent. w.p.) to the standard January white oil spray (for white wax scale control) were tested. Percentages of clean friut harvested from the trees in December, 1960 were: Zinb 98.6 per cent., trithion 96.8 per cent., tedion 95.9 per cent. and kelthane 93.2 per cent.

Lemon Bud Moth (Prays nephelomima).—Nicotine and gusathion programmes were used in a trial on 108 lemon trees at Kulnura in autumn, 1960. They gave good protection against infestation of the blossoms.

The trees were inspected at intervals over the year to follow the progress of the various blossomings and settings of fruit. At harvest, there appeared to be no difference in yield between untreated trees and those trees where the blossom was protected.

This first work was carried out in a season of heavy summer crop blossom. Protection of the blossom may be important in a season of light summer crop bloom. So, the work is being continued.

Snails (*Helix aspersa*).—Snails attacked citrus trees heavily, especially in some orchards which had not received Bordeaux sprays during the autumn.

Following a report of experience in California, gusathion 0.05 per cent. w.p. plus white oil (½-gal./100-gal.) was used on lightly infested trees at Somersby in May. The snails were severely affected by the spray and fell from the trees; but deaths were slow and final mortality was not complete.

VEGETABLE PESTS

Tomato Caterpillar (*Heliothis armigera*).—In collaboration with the Biology Branch, water-mist applications of insecticides and fungicides were again tried on tomatoes at the Citrus Experiment Station, Narara. A block of about 400 trellised tomatoes received weekly applications from a "Motoblo" misting machine, using DDT-rogor-copper oxychloride.

The misting was quite successful; even a programme applying half of the previous standard recommendation of DDT and copper for misting appeared satisfactory.

Leaf samples, for analysis of spray deposit, were taken by the Chemistry Branch before and after each application.

Potato Aphid (*Macrosiphum euphorbiae*).—A joint project with the Biology Branch on the virus nature of the disease causing yellow top in tomatoes was finalised.

A study of the characteristics of the virus suggested that it was of the "persistent" type. Infective aphids were able to cause transmission serially for ten days and after moulting, without further feeding on infected leaves.

Length of the inoculation-acquisition feeding periods of *M. euphorbiae* was determined. Under experimental conditions, the aphid required a minimum feeding period of ninety minutes to acquire the virus, and thirty minutes to inoculate healthy seedlings. Optimal transmission of the virus was attained with an acquisition feed of eight hours and an inoculation feed of three hours.

Inoculated plants developed symptoms of yellow top after eighteen to twenty-one days.

A weed, *Solanum nigrum*, was shown to be susceptible to tomato yellow top virus. Symptoms were a general stunting of plants, leaf mottle, marginal chlorisis, and premature leaf abscission.

Healthy tomato seedlings infested with aphids transferred from stunted chlorotic *S. nigrum* plants, developed yellow top. Conversely, healthy *S. nigrum* seedlings, infested with aphids from tomatoes infected with yellow top, developed the symptoms noted above.

It is suggested that *S. nigrum* is a significant source of infection for crops of tomatoes.

French Bean Fly (*Melanagromyza phaseoli*).—A spraying experiment was carried out at Matcham in autumn, 1961, on French beans, under conditions of light infestation. The sprays were DDT 0.05 per cent., rogor 0.05 per cent., lebaycid 0.05 per cent. and metasystox 0.05 per cent., all as emulsions. Each material gave satisfactory results.

The promising seed treatment method of protection against damage by bean fly was again tried in the autumn at the Citrus Experiment Station, Narara. Endrin seed dressings were used. Results have not yet been assessed.

At Murwillumbah an experiment using endrin treated seed showed that bean yields were similar—whether a full, partial, or no DDT spray schedule was applied, although stem infestation was much higher where no spray was used.

Insecticidal Application to Cucumbers.—In November-December, 1960, at Narara, a phytotoxicity spraying trial was carried out on cucumbers.

Sevin 0.2 per cent w.p., sevin 0.1 per cent. w.p., rogor 0.05 per cent. emulsion, dieldrin 0.1 per cent. emulsion, dieldrin 0.05 per cent. emulsion, lebaycid 0.05 per cent. emulsion, gusathion 0.05 per cent. w.p., trithion 0.03 per cent. w.p. and "Multanin-Ultra" 0.1 per cent w.p. (purified DDT and lindane), were each applied once a week for four weeks.

Sevin caused some yellowing and scorching, and some stunting in the plots treated with the higher concentration, but the effects were not severe. "Multinan-Ultra" caused some inconsiderable leaf mottling. The other treatments caused no injury.

PESTS OF LIVESTOCK

Insecticide Resistance Studies with Sheep Blow-fly.—These studies have confirmed that a single gene explains the related resistances to BHC, aldrin and dieldrin.

Tests with strains from different areas in New South Wales, Tasmania and Western Australia have revealed that one gene allele is involved in field instances of resistance in the blowfly.

Selected strains have remained fully resistant to dieldrin for twenty-four generations. This is in contrast to previous observations which showed rapid reversion to susceptibility.

The organic phosphate insecticides continue to give field control of resistant blowflies. There are indications of physiological resistance to diazinon in strains which have been under selection pressure from these insecticides for the past three years.

DOMESTIC PESTS

Argentine Ants (*Iridomyrmex humilis*).—The Department of Local Government formally accepted responsibility for continuing Argentine ant eradication. Cabinet approved of an organisation being set up under the Department of Local Government, largely in line with the recommendations made by the Committee in September, 1959; and directed that enabling legislation to this end be prepared. Recommendations for the appointment of the officer-in-charge, and three of the four technical assistants, have been made.

Eight new areas of infestation, totalling about 100 acres, were reported since 1st July, 1960. Thus, twenty-eight areas covering about 750 acres now require to be sprayed.

Surveys were made to detect the presence of Argentine ants in the main country towns on the Hume and Olympic Highways and on the New England and Pacific Highways (including Newcastle and Maitland). A publicity campaign was also initiated in these towns largely by means of the new Argentine ant colour picture leaflets. This leaflet distribution has been followed by screenings of the Argentine ant 35-mm. film ("Ant Menace") in most of the New South Wales country towns—by courtesy of theatre proprietors and British Empire Films Ltd.

Argentine ant activity has remained at a high level throughout the year, apparently encouraged by the gradual build up to warmer weather without great variation in temperature and climate generally and by the comparatively mild 1960-61 summer and autumn. Build-up of populations in the Guildford area appeared to be unusually heavy.

The number of new areas of infestation found in 1960-61 was, by far, the smallest in recent years.

Cockroaches (*Periplaneta americana*).—Laboratory trials of various insecticidal dusts gave some information on the most suitable materials for use against these pests.

Of the organic insecticides, 2½ per cent. malathion, 2½ per cent. diazinon, and 0.25 per cent. pyrethrins (plus 2.5 per cent. piperonyl butoxide) each were satisfactory as far as speed, knockdown and residual value were concerned.

A silica aerogel (Dri-Die 67) gave comparable results but has the disadvantage of extreme lightness (4.5 lb. per cubic ft. density)—making it difficult to use.

GENERAL

Aphid Investigations.—A programme of aphid trapping was commenced at Rydalmere and Dural in October, 1960. At Rydalmere between 11th October and 2nd June, a period of thirty-four weeks, more than 3,000 aphids were trapped, comprising thirty-two species. Of these, *Aphis spiraecola*, *Melanaphis bambusal*, *Schizaphis* (*graminum*?), *Hyalopterus pruni* and *Rhodobium porosum* are believed to be the first recorded incidences in the Sydney region; and the *Tinocallis ulmiparvifoliae specimens* provided verification of Mr. E. H. Zeck's claim some years ago that this Japanese species was present in Australia.

SYSTEMATIC ENTOMOLOGY

The Collection.—During the year 5,828 insects were mounted; and another 4,560 specimens were remounted because of damage done by verdigris. The above specimens plus a number from store boxes and other sources were incorporated in the systematic collection, to a total of 11,122. A total of 155 tubes of identified larval material was received for inclusion in the spirit collection.

No new species has been described but some new ones have been located during the year.

Hemiptera.—A new *Orchamoplatus* (*Aleyrodidae*) has been located on croton at Murwillumbah; and a new *Trioza* (*Psyllidae*) on *Eugenia coolminiana* at Roseville. Also recorded for the first time was *Paelius azaleae* Baker and Moles (*Aleyrodidae*), on azalea.

Coleoptera.—A new Carab (*Pterostichini*) was found to be predaceous on *Othnonius batesii* at Graman. It is possibly a new genus.

Diptera.—An Asilid, found at Graman, and stated to be predaceous on *Othnonius batesii*, was not represented in the Australian Museum collection. It could only be named to the genus *Promachus* at the British Museum. A Dolichopodid, *Medetera* sp., was found at Roseville.

Arachnida.—A species of Argas was found at Hammondville and identified by Dr. Kahls of Montana as new. A new Trombidiid mite from pasture at Koorawatha and a new Erythriid from Roseville were identified by H. Womersley.

Weevil Studies.—As weevils of economic importance are widely distributed among the forty-three subfamilies of weevils stated by Tillyard to occur in Australia, a primary aim is to arrange the subfamilies in phylogenetic order. All weevils are being examined and named as far as possible, even if only to the subfamily, and then arranged in the collection. So far the following subfamilies have been examined and arranged:—

> *Brachyderinae, Otiorhynchinae, Eremninae, Leptopinae, Tanyrrhynchinae, Cylindrorpinal, Rhytirrhininae, Rhyparosominae, Somatodinae, Diabothrariinae, Amycterinae, Conipterinae, Rhadinosominae, Hyperinae, Cleoninae, Hylobiinae, Pissodinae.*

Particular attention has been given to the subfamily *Brachyderinae*. A check list of all literature dealing with species in this group is being compiled. Of about fifty species, only seventeen holotypes are located in Australia (at the South Australian Museum). The remainder are mainly in various European museums.

Chemistry Branch

Cereal Section

Export Wheat and Flour

Testing Wheat Exports to China.—At the request of the Australian Wheat Board and Department of Primary Industry, the wheat being exported to China through Sydney and Newcastle wheat terminals has been continuously sampled and tested. Since January, thirty-four wheat shipments have been examined and certified. About two-thirds of the total of 330,000 tons was shipped from Sydney and one-third from Newcastle.

Flour shipments have also been sampled and certified. Improved chemistry facilities have made it possible to police the quality of flour exported more closely. A number of mills have been warned about their flour quality, and a cleaner product has been presented in later shipments.

Grain Quality Investigations.—The Section provided for the New South Wales Standing Advisory Committee on Wheat information about quality of several promising new varieties under consideration for release for commercial production. Two new Gabo back crosses, Mengavi and Gamenya, were recommended for the northern areas, for ultimate replacement of Gabo—now rust susceptible.

The departmentally bred Falcon was also recommended, mainly for the south and west of the State. Some criticism was levelled at Falcon by the flour milling trade, for physical hardness, high water absorption and low flour yield. Departmental evidence did not confirm all these factors. Procedures are being undertaken on the experimental mills to obtain further data on flour yield and starch damage.

Quality of the 1960-61 *New South Wales Crop.*—Representative samples from the 1960-61 harvest were tested for the Government Grain Elevators Board, to assess the quality of the wheat received at the various silos throughout the State. The Board uses the information to assist disposal of the harvest to best advantage. The information is also essential in the Wheat Segregation Survey undertaken by the Cereal Section. It also assists extension work with the flour mills; and, when taken in conjunction with the official F.A.Q., enables forecasts relevant to specifications for export wheat.

Seventy silos were sampled during the 1960-61 harvest. The 6,000 samples have been made into weighted composites using appearance and stated variety as a basis for the separations. Protein results of these composites have shown a significant difference between hard and soft wheats.

The sampling techniques have again been tested, and duplicate truck samples were again taken and tested by the protein method. Results indicate a low sampling error and this will be confirmed by statistical analysis.

The composites await testing by experimental milling, test baking and physical instrumentation. Postponement of the tests was caused by the wait for instruments, on order and not yet delivered.

Project to Investigate Soft Wheat Quality.—Funds have recently been made available for this and action has been taken to advertise for an analyst to undertake it. The appointee will spend a preliminary period of up to six months in the laboratories of a leading biscuit manufacture.

Pesticides Section

Cattle Tick Formulations.—Formulations were investigated with a view to improving their performance in the control of the cattle tick (*Boophilus microplus*).

Correlation of dip concentration with deposition and toxicity of DDT was carried out at the Glenfield Veterinary Research Station, in a dipping trial designated Glenfield No. 7, 1961. In this trial a further supercooled melt formulation was employed such that the dip concentration was progressively raised from one to four times normal. As in the previous trial (Glenfield No. 6, 1960) the treatment did not cause any toxic symptoms to appear in the dipped calves—even at four times normal strength.

The conclusion is that calves must be exceedingly tolerant to DDT, or that the DDT deposited on them was in a form of low mammalian toxicity. The former may be the more valid, since in-vitro tests with bush ticks (*H. bispinosa*) showed that the dips were quite toxic to adult female ticks.

Striking differences in crystal shape and form of the DDT in dips was observed. It is thought that these properties play an important part in dip effectiveness.

The research outlined has been complementary to investigations done in the Quarantine Areas of northern New South Wales.

To show the effect of physical properties of dipping formulations, experiments using flour beetles (*Tribolium confusum*) were conducted. The concentration of the surface active agent in the dip influenced the adherence of DDT crystals to the surface of the insects and hence the toxicity of the dip. These experiments are proceeding.

Sheep Dip B.H.C. Evaluations.—Evaluation of sheep dips used for control of Itch Mite continued. Samples containing mixtures of various isomers of benzene hexachloride were anlysed on behalf of the Veterinary Medicines Board.

Phenothiazine for Sheep Drenches.—Investigation of phenothiazine for control of worms in sheep was continued from the previous year, to provide information for the Veterinary Medicines Board on various brands sold to graziers. The cost to the grazing industry of this drench ranges from one to two million pounds per year depending upon the season.

Analytical difficulties in testing for purity and in particle size measurements have been largely overcome.

Meetings of the Standards Association Committee for Pesticides, in which this Chemistry Branch is represented, dealt with phenothiazine. Comparative laboratory tests involving several manufacturing laboratories and the Chemistry Branch were organised to arrive at agreement between different operators in respect of two air-permeability methods used to measure surface area of commercial phenothiazine.

Lindane for Plague Locus Control.—Shipments of lindane from Japan purchased by Government Stores Department for the Department of Agriculture have been checked for purity. All consignments have been of high quality.

The lindane concerned is to be held in store and released to manufacturers for formulation into emulsifiable concentrates at such time as outbreaks of the plague locust occur. The procedure of buying and storing the pure active ingredient is intended to overcome difficulties in obtaining suitable insecticide at short notice.

Copper Fungicide on Tomatoes.—Misting is being evaluated against the normal high volume spray, in the control of Early Blight of tomatoes by copper fungicides.

Fineness/Coarseness Grade of Sulphur is Important

Rates of availability (to the plant) of different grades of sulphur as used in sulphur-fortified superphosphate are being studied. The right-foreground plot received a readily available form of sulphur. The left-foreground plot received a slowly available, coarser grade of sulphur.

Aspects studied have been: the deposition and retention of the fungicide (currently copper oxychloride) on foliage; the coverage and penetrating properties of the two techniques, by analysis of foliage and stems of plants; and the degree of blight control, from the weight of fruit collected. It is a co-operative project, involving a pathologist, a chemist and an entomologist.

Preliminary estimates of the results have shown that, using the misting technique the amounts of copper sprayed can be reduced by half without affecting the degree of disease control. Misting also possesses other advantages for the farmer.

Removal of Spray Residues from Pome Fruit.—This year the invesigation has proceeded along the following lines:—

- Analysis of samples from apple washing trials at Bathurst Experiment Farm;
- analysis of samples received from New South Wales and Tasmania for the pesticide spray residue survey;
- preparation of methods of analysis for spray residues containing some of the newer pesticides, viz., sevin, systox, glyodin, melprex, kelthane and karathane.

In the washing trials a high proportion of lead arsenate spray residue was removed but, under similar conditions, very little of a DDT residue was removed.

Twenty-nine survey samples were analysed. About half of them were from Tasmania and the others from New South Wales (Bathurst, Batlow and Orange). The pesticides determined included mercury, sevin, lead and arsenic, in addition to the eight determined during the previous year.

The samples from Tasmania were generally more difficult to analyse because of their mixed spray programmes; there was interference in some determinations.

With one exception the results were within the tolerances set by the F.D.A. (U.S.A.); and in almost every case very much less than the tolerance.

The investigation of methods of analysis of spray residues of newer pesticides is proceeding.

WATERS SECTION

The Water Analysis Service.—The Branch continued the very useful functions of analysing water samples for landholders and Public Bodies, and advising by written report on the suitability of the water for stock, irrigation and rural-domestic use. Eight hundred and sixty-three (863) samples were tested in the Chemistry Branch.

Regional Water Testing Kits.—Supplementary to the foregoing, the decentralized service established in 1959-60, in the nine Agricultural Regions, and in the important Lower Murray Irrigation Area, satisfactorily supplied on-the-spot service to landholders. The Regional services analysed some 1,200 samples of water, and issued reports on the findings and recommendations.

Decentralized pH Meters and Soil Salinity Equipment.—Funds for purchase of the aforementioned Kits were obtained from Commonwealth Extension Grants. Funds this year were made available for purchase of pH meters and soil salinity testing equipment. This extends the usefulness of the Kits, in examination of problems associated with soil salinity and soil acidity/alkalinity reaction.

Extended Educational Programme.—Provision has been made also for employment of a special officer, to be responsible to the Chief Chemist for extension of the educational programme planned for landholders and Regional officers—on water and soil salinity testing.

Meantime, Regional officers have been given refresher instruction in the use of the apparatus and interpretation of the analytical data; and Information Bulletins have been prepared and issued to field personnel.

Demonstrations for the public have been given at field days and country shows; and the decentralized service has had good publicity from country press and radio.

Interstate Interest in the Kits.—At the request of the Director of Agriculture of the Northern Territory Administration, a facsimile New South Wales Department of Agriculture Regional Water Test Kit is being assembled for use by Commonwealth agricultural officers at Alice Springs. A request has also been received from a primary producer organisation in Tasmania.

Salinity Meter Improved.—An improved model of the "Salitest", transistorized salinity meter, designed in the Branch in 1959-60, has been produced this year. Designed as a do-it-yourself unit for landholders to test the salinity of stock and irrigation waters subject to variation of salinity levels, the "Salitest" has found approval with a number of landholders, primary producer organisations and government instrumentalities. There has been interstate inquiry and interest in this improved model too, and the use of the meter could become Commonwealth wide.

GENERAL AND REGULATORY CHEMISTRY

Vitamin A in Stock Feeds.—Methods for determination of Vitamin A in stock feeds and concentrates have been examined and improved. This has been a prelude to a survey of the Vitamin A potency of such products, to be undertaken in the forthcoming year.

The further activities of this section have included the following:—

Regulatory Analyses of Stock Food.—Samples taken in accordance with the provisions of the Stock Foods and Medicines Act have been examined for protein, fat, crude fibre and salt contents. In several instances the composition was not in accordance with the manufacturers' claimed analysis, and appropriate action was taken.

Banana Meal Stock Feed (?).—Samples of banana meal manufactured from waste green bananas or small bananas during periods of over-supply have been examined, since this product was suggested to have value as a stock food. The manufacturers have been advised of its present limitations, and on methods to make the product more acceptable for stock feeding.

Faulty Veterinary Medicine.—Samples of a registered veterinary medicine were analysed, following reports that an animal had died shortly after administration of the drug. Each analysis showed that the concentration of active therapeutic ingredient was not in accordance with the registered formula. The matter is under attention of the Veterinary Medicines Board.

Oil-impregnated Fruit Wrappers.—Samples were examined for conformity to the S.A.A. Standard Specification N29. Correct oil-impregnation of paper wraps is important, to protect Granny Smith apples against incipient scald during cold storage.

PHYSICAL AND ISOTOPES SECTION

New Facilities.—The Physical and Isotopes Sections of the new Rydalmere laboratories have required special fittings to a greater extent than the other Sections, and have been the last completed. Because of this, a lot of work normally done on the Medium Sceptrograph had accumulated before this instrument became available again.

The Large Spectrograph has now been installed complete with services and auxiliary equipment. Action is being taken to organise suitable projects for work with this instrument.

Radioactive Isotopes.—Owing to the danger of radioactivity, it is not possible to use the isotopes laboratory until it is clear of tradesmen. The main cause of delay is a needed modification in a fume exhaust system. Investigations with the Plant Nutrition Section and the Soils Section await attention.

Goitre in Lambs.—In collaboration with Glenfield Veterinary Research Station, an investigation of possible goitrogenic activity in pasture plants growing at Crookwell is proceeding. It arises from incidence of goitre in lambs on the property in 1959. The experiments involve the use of the radioactive isotope, iodine-131.

Lectures on Radioactive Isotopes.—A further series of six lectures on the use of radioactive isotopes was delivered by the Physical Chemist to students of Agricultural Chemistry at the University of Sydney. The University has asked that these lectures be repeated later in the present academic year.

SOILS SECTION

Phosphate Studies.—Work continued on methods of testing soils for phosphate-supplying power. A lot of soils from U.P.S.E.T. trials were tested, but yield data has been available from only a few of these trials. Hence, only a few correlations of soil tests and response to superphosphate were made. Some soil tests were also done on earlier established trials on Experiment Farms.

Correlations are only fair for some of the trials. The correlation is reasonable in other trials, especially where such factors as moisture supply have not been limiting.

In the forthcoming year, a start will be made to test farmers' samples making best use of such information as is at hand. An attempt will be made to classify the soils as high, medium and low, and recommendations will be cautious. Co-operation of the District agronomist will be needed in each case, to report upon the results of the recommendations—so that further information may be obtained and the position made more satisfactory as time goes on.

Work is needed to find the principal forms in which soil phosphorus occurs in each of the major soil groups; this would assist materially in assessing phosphate studies of routine samples.

Experience has shown that it is extremely difficult for the staff of the Soils Section to conduct "rates of superphosphate" trials in areas distant from Sydney. More reliance will have to be placed on pot work, unsatisfactory though it is in certain respects, to obtain approximate correlations for those soils where field trials cannot conveniently be conducted.

The second year's results from "Wheat Uniform Fertilizer Trials" (W.U.F.T.) showed poor correlation of yield response to super and soil phosphate tests.

Potassium Studies.—A project to assess a soil's ability to supply plants with potash has begun. It is a large pot experiment with seven soils, some known to be potash deficient and some not deficient. They are from various parts of the coastal belt—Lismore, Taree, Leppington, Gosford, Berry, for example.

Potash response of millet on these soils will be examined, by cropping the soils until growth without potash is negligible; that is, until available potash is virtually exhausted. Then a study will be made of: (*a*) the correlation between response and several methods of extraction and, (*b*) the distribution of potash in various mineral fractions, and the exhaustion of these with continued cropping.

Preliminary trials to prepare against pitfalls in this experiment have been carried out. The pot experiment proper will commence in the glasshouse in the spring of 1961.

Nitrogen Studies.—Little work was possible on the Bellingen soils during the year, due to staff shortage; but the work may be more vigorously pursued in the coming year when one of the existing vacancies is filled.

Soil Surveys.—(i) Balranald—A detailed survey at the request of Balranald Shire Council was completed on 3,000 acres at Balranald in relation to irrigation settlement; in addition, field work is almost complete on a further 30 to 40 square miles at Balranald and Lake Benanee where the aim has been to delineate soils suitable for citrus and vine culture.

(ii) Seven River, Ashford—A survey of some 400 square miles of soils along the Severn River near Ashford was completed. The aim was to delineate soils suitable for tobacco growing.

Soil Physics.—The project mentioned in the 1959-60 Annual Report, viz., to find the cause of salting and remedies for it in valuable land at Richmond on the Hawkesbury River has been completed. The report is in the final stages of preparation.

Briefly, it was found that a permanent water-table, which is salty, had been raised high enough by a series of wet years and floods since 1946 to cause salting at the surface.

The main remedy is to keep this water table below a certain critical depth by a suitable interceptor drain around the scarp overlooking the salted area. Salt in the soil will then be gradually removed by irrigation and the trouble should not recur.

Lectures.—An officer of the Soils Section delivered eleven lectures and led a Seminar, for 3rd and 4th year students of Agriculture at Sydney University. Talks were given to Agricultural Bureau short-term schools for farmers.

PLANT NUTRITION SECTION

Scope and Volume.—The work of the Plant Nutrition Section occurs broadly under two headings:—Research work; and Diagnostic work for the Biology Branch and field officers (District agronomists and fruit officers and Experiment Farm agronomists). Over 10,000 analyses were made during 1960-61, including 5,042 nitrogen, 2,860 phosphorus, 799 potassium and 610 sulphur determinations.

Nutrition Research Work

Apple Investigations.—Several factors influence uptake of minerals by plants. Levels of minerals in leaves are influenced by the season, age of the leaf, time of sampling, variety, stock, and other factors.

In the 1959-60 season the variation of the nutrients in apple leaves from December to April was studied at two centres, Oakdale and Armidale, on Granny Smith apples. Similar work had been carried out previously on Jonathan apples in the Oakdale and Orange districts.

Curves showing the variation for nitrogen, phosphorus and potash are very different for the two varieties Jonathan and Granny Smith.

Results indicate that sampling for diagnostic purposes is best carried out in December. There is a steep fall in the concentration of nutrients in the leaves after December and January, and it would then be undesirable to sample.

Citrus Nutrition Investigations.—These continued in the pot experiment at Gosford. The leaves have been sampled and analysed three years in succession, and the fruit harvested for quality tests and physical measurements. A comprehensive report has been prepared.

Citrus Leaf Sampling Techniques.—Sampling techniques prior to analysis are very important. Sampling procedures in general have been tested in the 1959-60 season on six orchards in the M.I.A. These tests take into account such factors as: leaves from a particular side of the tree, or all round it(?); leaves from what number of trees, for reliability (?); spring flush leaves, at various ages (?); and others. Results have been interesting and valuable. The study is continuing.

Molybdenum in Maize.—The Taree case of hybrid maize affected by molybdenum deficiency, led to a State-wide survey to pinpoint the areas molybdenum-deficient in relation to hybrid maize seed production.

Maize grain was collected from all the hybrid maize seed growers in New South Wales and analysed for molybdenum. Then seeds of low molybdenum content were sown in trial plots in molybdenum-deficient areas.

Symptoms of molybdenum deficiency appeared firstly on young seedlings about two or three weeks old. High mortality was usually associated with onset of the symptoms. The results of this investigation will be published in the *Journal of the Australian Institute of Agricultural Science* shortly.

Potash for Grapes (?) at Cessnock.—In a previous survey of nutrients in grape leaves, potash appeared to be lower in the Cessnock district than in other grape-growing areas of New South Wales. Accordingly a factorial experiment involving rates of application and methods of placement of nitrogenous, phosphatic and potash fertilizers was established. Yields, sugar content and nutrient levels of the leaves and petioles have been studied. Limited information has been obtained so far, and the work will be continued for a number of years. By overseas experience, it takes about five years from the time of application of potash fertilizers for significant alteration in the levels of nutrients of leaves to show up.

Uniform Pasture Survey and Extension Trials ("U.P.S.E.T.").—Many analyses have been made from U.P.S.E.T. trials. Results are coming to hand very rapidly.

Phosphorus and sulphur levels from the tablelands areas agree very closely with the dry matter yields. Pronouced statistical differences between the phosphorus and sulphur levels of leaves from treated and untreated plots have been found.

Areas of Copper Toxicity in Sheep.—Because copper toxicity in sheep occurs in the southern part of New South Wales, a new type of trial within the "U.P.S.E.T." has been established at the request of Division of Animal Industry. This aims to obtain more data on distribution of the toxicity.

Division of Animal Industry is co-operating in pertinent "U.P.S.E.T." trials, and the Plant Nutrition Section will analyse pasture samples from these areas. There is a well-known relationship between copper, molybdenum and sulphate in respect of copper deficiency and copper toxicity. Analyses for these nutrients will be done on samples from the trials.

Nitrogen in Pastures.—Price of nitrogenous fertilizers has fallen dramatically in the past 3-4 years. Ammonium sulphate is now available at £23 per ton from the manufacturers. The drop has stimulated more research on nitrogen usage in pastures.

The Department has been studying the use of nitrogen at Lismore, Berry, Hawkesbury, Glen Innes and other centres. The Plant Nutrition Section has carried out many thousands of nitrogen determinations in relation to these research plots, and information about nitrogen usage has become much clearer.

A belief was that applied nitrogen had no place in pasture management. Results from centres mentioned in the foregoing paragraph indicate that the belief was unsound, that there is a future for applied nitrogen—particularly where irrigation is available. In addition, the University of Sydney has demonstrated the practical economics of nitrogen fertilizers on pastures in the County of Cumberland.

Grades of Gypsum.—Previous work has indicated that very fine fractions of gypsum are readily available to plants and that coarser fractions apparently are unavailable. The availability of the various grades is being studied at Rydalmere in plants grown in the glasshouse on acid-washed sand. The test plant is *Phalaris,* excellent indicator of sulphur deficiency.

A number of harvests from this grass will be taken, and each harvest analysed for sulphur. This is to study the recovery and availability.

A similar type of experiment is in hand at Hawkesbury Agricultural College in relation to the various sulphur-fortified superphosphates. It has been thought that the added sulphur in some of these types of superphosphate is unavailable to plants in the first year. So, the materials are being tested to determine the sulphur availability.

The glasshouse work is concurrent with field trials. These have shown that only the finer fractions of sulphur are available in the first year, with evidence that the coarse fraction becomes more soluble in the second and third years, whereas the finer fractions respond quickly in the first year but run out in the second and third years.

Predictability of Superphosphate and Gypsum Needs in Pastures.—There is evidence from the "U.P.S.E.T." trials that chemical tests of clover leaves for phosphorus and sulphur may help to predict when superphosphate and gypsum are needed on pastures, particularly on the northern tablelands.

Before such tests can be implemented, more must be known about the variations of these nutrients under different moisture stresses and at different times of the year. Accordingly, an experiment is being conducted under glasshouse conditions on two soil types. These have been treated with three levels of fertilizer to study variation of phosphorus, potash, molybdenum and sulphur in plants during the growing season.

Plant material will be harvested at regular intervals and it is expected that important variations in the levels of the nutrients in the young clovers will show during the season.

Mineral Deficiency Symptoms in Clare Subclover.—Acid-washed sand is being used in a glasshouse study, of symptoms. An experiment has been prepared in pots designed to develop symptoms of nitrogen, phosphorus, potash, calcium, magnesium, sulphur, boron, copper, manganese and zinc deficiencies.

Such symptoms in some of the other varieties of subclover have been examined by Millington of Victoria. Clare sub-clover is the most popular variety for the coastal districts of New South Wales, and it is felt that this work is timely.

Diagnostic, Plant Nutrition Work

The value of soil and plant analyses is a very controversial subject. Many eminent authorities hold different views. The Plant Nutrition Section has been doing plant analyses for twelve years, and the evidence accumulated tends to indicate that analysis is of definite value. Several factors, however, become more evident as results of work come to hand. There is a lack of understanding of the physiology of the plants, and a grave lack of knowledge regarding factors which influence uptake and concentration of nutrients in leaves. As more work is done on these factors, the use and interpretation of plant analyses will increase.

There is a natural reluctance to base recommendations or suggestions on the results of small differences in the concentration of nutrients in leaves. But there is often so spectacular a difference between the levels of nutrients in healthy and unhealthy plants, or between the levels in unhealthy plants and accepted critical levels, that there is little doubt of a function for plant analyses in the diagnosis of certain deficiencies and toxicities.

Since the techniques of sampling are so vital and critical, samples for analysis are as a general rule accepted only from Departmental officers. They are often able to supply relevant data and description of symptoms which, when weighed with the results of plant analysis, often reveal causes of nutritional disturbance.

Citrus Diagnoses.—Considerable citrus analysis information is available, by comparison with most other plants. An interesting range of samples and results has been received and recorded in the Plant Nutrition Section in the past year.

Citrus is known to have a very low potash requirement but a deficiency of this element is often associated with a serious decline in the general health of a tree. Many samples showing potash deficiency have been analysed from different districts in inland irrigation areas including the M.I.A. and the Murray district. Levels as low as 0.05 per cent. and 0.126 per cent. and 0.164 per cent. have been recorded. Often associated with potash deficiency have been other deficiencies such as phosphorus, or toxicities such as chloride, manganese and sodium.

Manganese deficiency and manganese toxicity frequently affect the health of citrus trees. Two outstanding toxicities reported in citrus were 1,940 parts per million in one-year-old seedlings, and 1,100 parts per million in Ellendale mandarins.

The most harmful toxicity in the Murrumbidgee Irrigation Areas has been chloride. Many affected plants contain as much as 4 per cent. chloride, with levels around 3 per cent. quite common. The critical level for chloride in citrus in general is about 0.6 per cent.

Several samples were received from the Northern Territory this year, two of them showed distinct chloride toxicity symptoms and very high levels of chloride—2.61 per cent. and 4.23 per cent.

Occasional samples affected with boron have been analysed. Some similarity exists between salt toxicity, boron toxicity and potassium deficiency symptoms.

Other Crop Diagnoses.—Deficiencies and toxicities have been recorded in many other crops. Some of the highlights were: prunes from Griffith containing 5.3 per cent. chloride, and the leaves severely marginal-scorched; tomatoes from Bossley Park containing 6.63 per cent. chloride and, on the same property, a small patch of tomatoes (watered from the town supply) quite healthy and with no accumulation of chloride; vines from the Hunter Valley containing 4.16 per cent. chloride; cherries from nursery stock at Young containing 2,000 parts per million of manganese, the leaves marginal-scorched and the trees dying.

YANCO RESEARCH LABORATORY

Suncracking Investigations on Rice.—No significant relationship has been found between grain suncracking and soil nitrogen. There is some evidence to suggest an inverse relationship between reducing-sugars in grain and suncracking.

Nitrogen Availability in Waterlogged Soil.—In a repeat experiment, a study of available soil nitrogen in waterlogged soils containing added fertilizers (ammonium sulphate, urea and ureaform) was made in a pot trial.

The control soils gave very low values of available nitrogen. This rose slightly during the period of the experiment; but, as in the earlier experiment, added fertilizers showed considerable non-availability towards the end of the experiment. Big reductions in available nitrogen occurred in pots containing rice plants.

Fertilizer Field Trial with Rice.—Analyses of rice leaf and grain from four 3 x 3 x 3 factorial N P K trials at low rates of fertilizer showed only very slight changes of nutrient level with application of fertilizer. The level of nutrients in leaf samples was characteristic of the site of the trial. Good correlation was found between leaf nitrogen and yields of paddy.

Nitrogen and Phosphorus Fertilizer—Tank Trial.—Very poor sandy soil was used. Rice leaf analyses showed big effects in nutrient levels in the leaf, due to both phosphorus and nitrogen.

Survey of Rice Field Soils.—Soil samples were obtained from fifteen district rice fields at the start of the season, before sowing. High correlation was found between yields of paddy and available soil nitrogen after ten-fourteen days waterlogging.

Botany Branch

ROYAL BOTANIC GARDENS, NATIONAL HERBARIUM, AND ALLIED ACTIVITIES

Construction of Expressway

Construction of the Expressway through the Royal Botanic Gardens and Domain necessitated constant attention, to minimise destruction and make adequate provision for restoration.

Plans have been prepared for erection of new Entrance Gates in Macquarie-street and in the south-eastern corner of the Gardens. A new service road to the Depot was constructed, and extensive alterations were made to the return road from Mrs. Macquarie's Point. A new Kiosk of modern design was erected in the Domain to replace the old one demolished during the construction of the Expressway. A new 6-inch water main was laid along the southern boundary of the Gardens.

Further trees and shrubs were destroyed or removed because of the Expressway, including two more Moreton Bay Figs from the southern end of Fig Tree avenue. This once magnificent avenue has been so reduced that retention seems hardly worthwhile. If there had been in the first place full information as to the extent of destruction contemplated by the planning authorities, it would have been possible to offer other suggestions for the route of the Expressway. Authorities intruding into the Gardens and Domain minimise the extent of their proposed operations to a point where they become quite misleading.

Royal Botanic Gardens

Improvements.—The main Rose Garden was completely renewed. It involved removal of all roses, trenching and fertilizing, and the planting of approximately 900 new bushes.

The native border of trees and shrubs adjacent to Mrs. Macquarie's road had become overcrowded in recent years. It has been cleared of surplus plants and the area completely re-organised.

The Camellia bed in the Middle Garden has been re-arranged with an additional 30 plants, mostly selections new to these Gardens. A new Begonia walk was also established in the Middle Garden.

Some 40 species of trees, shrubs and herbaceous-border species, not previously represented in our collections, have been planted out. Most were raised from seed obtained through the exchange system with kindred institutions throughout the world.

Re-designing and construction of paving around the glasshouses have been completed, to facilitate inspection of the displays.

The largest pond in the Gardens adjacent to Farm Cove was cleared of silt to a depth of some feet, and the soil was used to raise the level of other parts of the grounds.

A further area has been added to the propagating yards in a northerly direction, to compensate for land taken for construction of the new access road to the depot.

Supply and Exchange of Plants.—Selected species were sent to the Henty Court House, the Ingleburn High School and the N.S.W. Forestry Commission; and potted plants were loaned to the "Gardens of the World Exhibition" held in Sydney.

Plants of native orchids, New Caledonian plants of *Xeronema moorei*, and several tropical species, were appreciatively received from various donors.

Landscape Gardening Service.—The Landscape Gardener planned improvements in the Gardens; and also made inspections and advised and prepared plans for a number of governmental and semi-governmental institutions.

These included in country areas the Tamworth High School, Gunnedah Hospital, Gunnedah High School, a Cessnock factory site at request of the Premier's Department, and Victoria Park for Goulburn City Council. In the metropolitan area, landscaping services were provided for the Hunter's Hill Public School, Gladesville Central School, West Pennant Hills Primary School, Wahroonga Public School, two schools in the Manly district, the Department of the Army at Moore Park, the Department of Public Works for an area at the corner of Bridge and Phillip streets, the Commonwealth Building Research Station, Ryde, and Vaucluse House, Nielsen Park.

The Landscape Gardener also acted as a judge in an area final of *The Sydney Morning Herald* Garden Competition. He also gave lectures on "Planning the Home Garden" and similar subjects.

Glasshouse Activities.—Public interest in indoor plants has continued to increase, and a wide range of such plants has been exhibited throughout the year. Attractive displays of Gloxinias, Anthuriums, Primulas, Fuchsias in hanging baskets, and orchids have also been on show.

The glasshouse staff supplied, arranged and maintained decorations at the official rooms and at governmental exhibits at the Royal Agricultural Society's Easter Show. Decorations were set up in Parliament House for the opening session and other functions.

Vandalism.—Further instances of vandalism have been experienced, including disfigurement of several marble statues donated by the National Art Gallery trustees last year, and the defacement and removal of labels in the gardens.

Retirement of Foreman.—Foreman of the Gardens, Mr. W. Griffin, retired in June, [illegible]. Much of the high standard of Garden's maintenance evident in recent years was due to Mr. Griffin's diligence and efficiency.

The Domains

The Domain was used for the Anzac Day celebrations and as an assembly point for the Australia Day and Waratah Spring Festival processions.

Playing areas, although reduced by the construction of the Expressway, have provided good facilities for the various sporting bodies. There has been particular interest by the public as well as the participants in the mid-day football and basketball games.

Portions of the Domain adversely affected by construction of the Car Parking Station have not yet been properly restored. Intrusion of outside bodies into the Domain invariably results in long and unsatisfactory delays in restoration.

The area between Hospital Road and the new Supreme Court buildings was returfed and a concrete footpath laid.

Three garages to house departmental vehicles were constructed in the Domain depot to replace those lost during road construction.

Centennial Park

This area was maintained satisfactorily and the usual facilities were provided for sporting activities.

Special consideration was given to the possibility of developing areas in the southern portion of the Park, part of which has been occupied by Housing Commission huts. Suggestions have been made regarding possible treatment and use of these areas, but no decision has been made. Most of the land concerned is in its natural condition, but has considerable potential usefulness.

The Waverley Christian Bros. College was granted permission to erect a brick pavilion on the bank of the southern side of their playing area in Queen's Park.

Areas were made available to the Royal Agricultural Society to conduct equestrian events, the Cross Country Olympic Jumping Competition and the Dressage Contest.

Permission was granted to the Postmaster-General's Department to lay cables across the northern section of Centennial Park as part of the Intercontinental Telecommunication Cable system.

A tree planting ceremony was held by the Rotary club on a selected area.

National Herbarium

Plant Species new to New South Wales.—The following species were recorded within the State boundaries for the first time:—

Boisduvalia tasmanica, (*Onagraceae*) on Mt. Kosciusko. The genus *Boisduvalia* was not represented previously in this State.

Carex raleighii in the Snowy Mountains. This species was previously known on the Victorian Alps.

Juncus [illegible] at Koondrook State Forest, near Barham, south-western Riverina. This species is a common rush in Victoria.

Festuca species. An undescribed species of *Festuca* was found in the Nandewar Ranges and Barraba area.

Records of Rare Species.—The following rarely collected species have been identified during the year and added to the collection:—

Cryptocarya foetida, a coastal rain-forest tree, was rediscovered in the Cudgen Lakes area, Tweed River. This tree had not been collected since about [illegible], and was thought to be possibly extinct.

[illegible], at [illegible] near Orange. This species has been collected only a few times in New South Wales, though common in Tasmania.

[illegible], a small ground orchid collected at Moss Vale. It was the first specimen of it added to the collection for some thirty years.

Thelymitra circumsepta, a "Sun Orchid" previously known from a few specimens collected at Mt. Irvine, Mt. Wilson, Mt. Tomah and Bell. It was collected at Carrington Falls on the nearer south coast ranges.

Extensions of Range.—As a result of field observations by botanists, and submission of specimens for determination, the known range of species has been extended as listed below. Previous limits are stated in brackets:—

Alphitonia excelsa, "Red Ash", at Mt. Dromedary (Milton).

[illegible], at [illegible] (Hastings River).

Baloghia lucida, "Brush Bloodwood", at Mt. Dromedary (Milton).

Callitris oblonga, at Corang River, Southern Tablelands (Tasmania and New England).

Ceratopetalum apetalum, "Coachwood", near Bateman's Bay (Milton).

Cissus antarctica, a "Native Grape" or "Water Vine", at Mt. Dromedary (Bateman's Bay).

Cryptocarya glaucescens, "Silver Sycamore", at Mt. Dromedary (Milton).

Cryptocarya microneura, at Bateman's Bay district (Jervis Bay district).

Cudrania cochinchinensis, "Cockspur Thorn", at Milton (Nowra).

Dillwynia glaberrima, at Mellong Swamp (Colo-Putty Road).

Diospyros australis, "Native Ebony", near Bateman's Bay (Milton).

Drimys insipida, in Bateman's Bay district (Milton).

Elaeocarpus kirtonii, at Milton (Nowra).

Eucalyptus andreana, at Boggy Swamp Creek near Putty (Colo River).

Eucalyptus rudderi, at Scone (Taree-Gloucester, Cessnock and Picton-Burragorang).

Excoecaria agallocha, "Milky Mangrove" or "River Poison Tree", in Macleay River district (Richmond River).

Fimbristylis nutans, Angourie, east of Grafton (Richmond River).

Gahnia filifolia, on Currockbilly Mountain, near Braidwood (Mt. Werong, Oberon district).

Gymnema sp., in Scone district (Queensland Border).

[illegible], at Sublime Point (Centennial Park).

[illegible] *scandens*, at Mt. Dromedary & Tilba Tilba (Kiama).

Olax stricta, at Green Cape, south of Eden (central and north coast).

Oxylobium pulteneae, at Colo Heights (Howes Valley).

Palmeria scandens, in Bateman's Bay district (Kiama).

Polyosma cunninghamii, "Featherwood", in Bateman's Bay district (Milton).

Prasophyllum flavum, at Fenwick's Creek, Upper Hastings River (Hawkesbury River and Queensland).

Pterostylis fischii, on the Gibraltar Range thirty miles east of Glen Innes (Grose Valley).

Pterostylis pedoglossa, at Mt. Victoria (coastal belt).

Rhodamnia argentea, "Malletwood", at Milton (Kiama).

[illegible], Katoomba-[illegible] (Blackheath-Lithgow).

[illegible], six miles west of Mittagong (Hilltop).

Sloanea australis, "Maiden's Blush", near Bateman's Bay (Nowra).

Thelymitra circumsepta, at Carrington Falls (Mt. Wilson, Irvine and Tomah, and Bell).

Weed Species Identification.—A weed species received from the Mullumbimby-Murwillumbah area has been determined as *Crassocephalum crepidioides*, a member of the family Compositae, native to Eastern Africa, which has become established in Indonesia and southern Asia. It was first noticed in the Brisbane area in [illegible] and since then has spread rapidly.

Reports from Queensland state that it has shown no tendency to invade established pastures and at present appears unlikely to become a really serious weed. The name "Thickhead", a translation of the generic name Crassocephalum, is now generally accepted by farmers in south-eastern Queensland and could well be adopted in this State.

A specimen from "Elleslie" Station, fifty miles due east of Barringun, New South Wales, has been determined as *Dicrastylis lewellinii,* a native species from the Queensland border and the Alice Springs area. It is a low shrubby plant belonging to the family Verbenaceae.

The owner states that some 8,000 acres are now covered with this species. It follows the burning of spinifex, is very drought resistant, and not eaten by stock even in extreme drought.

Exchanges and Loans with Other Institutions.—A total of 1,067 sheets of herbarium specimens was forwarded to sixteen institutions throughout the world. These included special groups of plants such as *Eucalyptus, Acacia* and members of the Pteridophytes (ferns and allies).

In exchange, 1,033 sheets were received from eleven institutions; and, in addition, large quantities of duplicates of plants collected in Western Australia, South Australia, Queensland and the Hunter River Valley were presented by the C.S.I.R.O.

Specimens of New Caledonian and Burmese plants were donated by Dr. McKee. Central Australian material was received from Mr. G. Chippendale, Animal Industry Division, Alice Springs, Northern Territory. Many interesting tropical species were obtained from Hawaii. Several North Queensland ferns were received from the Brisbane Herbarium.

Many herbarium sheets were forwarded on loan for specialist attention at herbaria in Brisbane, Adelaide and Tasmania: and Manchester Museum, England.

Type material was received on loan from Europe; and herbarium specimens of *Poa* and *Lomandra* loaned from other herbaria were studied by specialists at Sydney.

Field Collections and Seed Exchange.—The plant collector undertook three major trips of from five to sixteen days' duration in the south coast area, southern tablelands and northern tablelands; and two trips each of two days' on the central tableland and central slopes. In addition, individual whole-day and part-day trips totalled a further thirty days. The mileage covered was 5,858.

The number of specimens collected in bulk quantities reached just over one thousand; and 104 bulk seed samples were obtained—much of the latter in response to special requests from other institutions for study, and cultivation.

Most of the herbarium material was for exchange purposes; but a lot of specific collecting of material required in the preparation of the publication *Flora of New South Wales* was undertaken. Much valuable information was obtained on the distribution of species of *Restio, Typhonium, Lemna* and *Wolfia.*

On request, 406 packets of seed samples have been received from forty-nine foreign and three Australian institutions. In exchange, 206 packets of seed, mainly of native species, have been sent to seventeen foreign and one Australian institutions.

Further Edition of the Index Seminum.—Compilation of this further edition was completed during the year, and is now due from the printer. It is anticipated that there will be a heavy call on our seed supplies following publication of this list.

Field Investigations.—The botanical staff was particularly active in the field.

In the northern tablelands the grass genus *Poa* was studied. A general collection of grasses was made at the same time.

In Central Australia, many herbarium specimens and seeds of native species were collected.

In the Mittagong-Robertson area and on the south coast, *Acacia* species and members of the family Papilionaceae were studied. A special field study was made of ten species of the *Acacia decurrens* group of tanning-bark wattles. *Acacia* species were studied also in the Gosford, Doyalson and Wyee areas; also in the Woodford area of the Blue Mountains, and on the far north coast of New South Wales and in southern Queensland.

In Western Australia, *Eucalyptus* species were studied. This was relative to the preparation of an improved classification for this important genus. While in Western Australia, the botanist concerned also studied the genera *Casuarina* and *Juncus.*

On the south coast of New South Wales the composition of the brush-forests was studied.

On the Cox's River an area where the type material of Allan Cunningham's *Grevillea rosmariniformis* was originally collected was searched, but no trace could be found of the species.

In Western Australia representative collections were made in the Eucla, Geraldton and Albany areas, where members of the Mytraceae, Rutaceae and Myoporaceae were features of the vegetation.

Many of the field studies mentioned were made whilst the respective botanist was on vacation in the area concerned.

Botanical Research

Publication of "Flora of New South Wales".—It is pleasing to announce publication of the first two parts of the "Flora of New South Wales".

The "Flora" is being published as a "Flora series" of the journal *Contributions from the New South Wales National Herbarium".*

The "Flora series" will be produced in parts, as material is prepared on each family. The parts will not necessarily be arranged in order, but each part will be numbered in accordance with the number assigned to the respective family in a Conspectus of the families.

The first part published contains the Introduction, Conspectus of Families, detailed treatment of the Gymnosperms with key to the five families represented, a key to all the Monocotyledon families of Angiosperms represented in New South Wales and detailed treatment of thirteen of these families.

The Introduction surveys the area and floristic elements of the State and its topographic divisions (with map) and gives a historical summary of previous systematic work on the flora; the proposed form and arrangement of the "Flora" is described.

The other part already published contains a detailed treatment of approximately half of the family Papilionaceae, together with a key to all the genera represented in New South Wales.

Two further parts are in press, and expected to be published shortly.

One of these contains a key to the genera of grasses represented in New South Wales, and a detailed treatment of approximately one quarter of the genera and species.

The other part contains detailed treatment of four families of ferns, the Davalliaceae, Grammitidaceae, Polypodiaceae and Aspidiaceae; and a Conspectus of the families of Pteridophytes in New South Wales.

Typescript has been completed for three further families of Monocotyledons—the Palmae, Araceae and Flagerllariaceae; and for six families of Pteridophytes—the Isoetaceae, Psilotaceae, Osmundaceae, Gleicheniaceae, Cyatheaceae and Azollaceae.

Work is well in hand on several other families for the "Flora"; including the Restionaceae, Xanthorrhoeaceae, Ranunculaceae, Hymenophyllaceae and Blechnaceae.

Publication—Contributions from the New South Wales National Herbarium.—Vol. 3, No. 1 of the regular series of this journal will be published shortly, having passed all proof stages. This contains a "List of the Vascular Plants Occurring in the New England Tablelands".

Material has been submitted for the printing of Vol. 3 No. 2. This will contain three short papers entitled, respectively:—

"Contributions to the Taxonomy of Australian Grasses II";

"*Typhonium brownii* Schott. and some Allied Species"; and

"Studies in Australian Pteridophytes, No. 3".

Revision of the genus Lomandra.—This has been completed. The results have been written up, both for incorporation in the "Flora of New South Wales" and for presentation of a preliminary paper. In the latter, several new species and subspecies will be described. A Key to the species present in New South Wales has been prepared.

Taxonomic Relationships of Certain Groups of Wattles.—An account of the taxonomic relationships of the *Acacia decurrens, A. pycnantha* and *A. melanoxylon* groups of wattles has been prepared for publication in the *Biochemical Journal*. Dr. D. G. Roux, of the Leather Industries Research Institute, Grahamstown, South Africa, is co-author.

Wattle Flowering and Fruiting Times.—A list of these times for twenty species of the *Acacia decurrens* group of Wattles was prepared, and sent to the geneticist at the Wattle Research Institute Pietermaritzburg, South Africa. Information concerning the length of time involved in pod ripening was also supplied.

A number of wood samples of the *Acacia decurrens* group were collected, identified, and forwarded to Dr. D. Roux, Grahamstown, South Africa, for biochemical research investigations.

Various Generic and Species Revisions and Studies.—Work has continued on revisions of the genera *Poa, Casuarina, Juncus* and *Lastreopsis* and species of *Acacia* of the *A. decurrens* and *A. ulicifolia* groups.

Taxonomic and nomenclatural notes on a large number of genera and species, including many *Eucalyptus* spp., have been prepared and will shortly be submitted for publication.

The genus *Restio* is being revised particularly with reference to the *Restio gracilis* group.

The collections of the genus *Xanthosia* (family Umbelliferae) in the Herbarium have been studied and a number of difficulties in the group have been resolved. It is evident that the common New South Wales species *Xanthosia pilosa* includes a number of different forms. Many of these are connected by intergrading series. The species needs further study, including cytological and experimental investigation, but the problems involved can now be seen more clearly.

The collection of specimens hitherto placed in *Dillwynia retorta* were sorted and investigated. The collection appears to include several subspecies and clines.

The collection of orchids in the Herbarium is being rearranged as a preliminary to the preparation for the "Flora" of a revised edition of the work published in 1943 under the title "Orchids of New South Wales" by H. M. R. Rupp.

Equipment has been obtained and work initiated on cytological investigations designed to throw light on current taxonomic problems.

In connection with studies in the family Lemnaceae for the "Flora of New South Wales", a minute, probably new, species of *Wolffia* was found in flowering condition at Penrith. A culture of *Lemna oligorrhiza,* originally obtained from the same locality, has been maintained in flowering condition for some months. The genus *Wolffia* has the distinction of being the smallest of flowering plants, the whole vegetative plant body being only about 1 mm. long. In *Lemna* the plant body is only a little larger. Both species are rarely seen in flower, partly perhaps on account of their highly inconspicuous nature.

Nomenclatural Change of Economic Interest (in Pumpkin and Melon Family).—Noted during the year, this concerns the species which includes the Water Melon, Pie Melon and the wild Camel Melon. Studies at the Institute for Study of Cultivated Plants, Gatersleben, Germany, have shown that this species should be known as *Citrullus lanatus.*

In recent years this plant has been known under various names (*Citrullus vulgaris, Citrullus battich* and *Colocynthis citrullus*) but all of these have now been shown to be incorrect. Gatersleben is a centre of research on all aspects of the cultivated and weedy members of the family Cucurbitaceae (the Pumpkin and Melon family).

Identifications

Apart from normal identification of plant material, several items of unusual interest required the attention of the staff.

Service in a Murder Case.—The outstanding item was the identification of plant material for the Police Department in connection with the murder of Graeme Thorne.

This necessitated identification of plants in the field where the body was found, and of many plant parts taken from clothing, a motor car and other places. The botanical investigations were correlated and the research botanist concerned gave evidence at the trial from which a conviction followed.

Police officers on the case regarded the identifications as of fundamental importance in solving this crime.

Plant Poison Case.—Police also obtained the services of a botanist to identify plants suspected in a case of the poisoning of several small children.

Miscellaneous Identifications.—At the request of the Smithsonian Institute of Washington, all the Australian specimens of *Blechnum* is that collection were submitted to this herbarium for determination.

The rare fern *Mecodium mnioides* from New Caledonia was identified, and large numbers of specimens collected by Professor N. Beadle, mainly in western New South Wales, were determined for the herbarium of the University of New England.

Content of millet-fibre in straw-brooms was investigated for the Department of Labour and Industry, and for several firms interested in their production and sale.

Visitors

The most distinguished visitor during the year was His Grace, the Duke of Devonshire, British Parliamentary Under Secretary for Commonwealth Relations, and owner of the world-renowned gardens of Chatsworth House, Derbyshire. His Grace expressed the opinion that the maintenance of the Gardens and Herbarium compared very favourably with similar institutions.

Among the scientific visitors from overseas who either inspected our activities or studied at our institution were: Dr. J. Hutchinson, author of "The Families of Flowering Plants", and late of Royal Botanic Gardens, Kew; Dr. C. Chalk, eminent wood anatomist, Forestry Institute, Oxford; Professor Taylor, Director, Vancouver Botanic Garden, British Columbia, Canada; Dr. F. R. Fosberg, United States Geological survey; Mr. K. Kannyun, F.A.O. Fellow, Bombay, India.

Australian scientific workers included: Mr. S. Everist, Government Botanist, Brisbane: Mr. E. H. Ising of South Australia; Mr. D. E. Symon, Waite Agricultural Institute; Dr. Marie Phillips, Parks and Gardens Section, Department of the Interior, Canberra; Dr. G. Barlow, University of Queensland; Mr. J. Green, Miss A. McCusker and Miss M. Roberts, New England University; Mr. Max Gray, Dr. G. Storey and Mr. G. Straatmans, C.S.I.R.O., Canberra; and Mr. A. W. Wilson, Superintendent of Parks and Gardens, Townsville, North Queensland, and one-time Landscape Gardener at Sydney.

General

Miss Barbara G. Briggs, Botanist, was admitted to the degree of Ph.D. at Sydney University in April. Mrs. V. Jones was appointed to an honorary position in the staff to work on the marine algae, a group of plants receiving increasing attention from commercial firms.

Three botanists attended the A.N.Z.A.A.S. meeting in Brisbane during May. They took part in discussions, served on the systematic botany committee, and participated in field excursions for collecting purposes.

The Director visited the University of New England, Armidale, to advise on the development of the grounds and incidental staff matters, later presenting a report and acting as referee in the appointment of a Superintendent of Grounds.

A direct telecast depicting the functions of the National Herbarium and the general history and development of the Gardens was made over the Australian Broadcasting Commission's Sydney station.

Lectures by members of the staff, some whilst on vacation, included one to the Alice Springs Science Group on problems of taxonomic treatment of the genus *Poa;* one to Agricultural undergraduates on the functions of the Branch; a broadcast on the history of the Herbarium and Gardens, in the voluntary Workers' Session of a Sydney commercial station; one to the Geranium Section of the Royal Australian Horticultural Society on "Propagation Methods"; one to the Naturalists Society of New South Wales on "Australian Ferns"; and others, to the Sutherland Rotary Club, the Rangers' League, Gosford Flora and Fauna Protection Society, Windsor Rotary Club, Lithgow Historical Society and several other institutions, on subjects ranging from "Wildflower Collecting" to "Seed Dispersal".

As in previous years the Director and botanists have served on several committees including the Remembrance Driveway committee, the Horticultural Advisory Committee of the Technical Education Department, the Muogamarra Trust, the Linneaen Society of New South Wales, and the systematic botany committee of A.N.Z.A.A.S.

Herbarium Accommodation

Protection against Fire Damage.—An automatic sprinkler and fire alarm system has been provided in the Herbarium building, to reduce the possibility of destruction of the priceless plant and book collections.

Inadequate Space.—Herbarium accommodation, is quite inadequate for the expanding collections, and for basic staff requirements. The needs may be met only by the proposed addition of a fire-proof wing to the present building.

AGRICULTURAL RESEARCH INSTITUTE, WAGGA WAGGA

Wheat Improvement

Field Testing.—Fourteen crossbreds together with several new varieties were sown at five centres—Wagga, Temora. Condobolin, Quandialla and Moombooldool. Conditions early were difficult but late rains enabled crops to finish well. Yields were high and, in general, the trials provided excellent opportunities for yield selection.

Two crossbreds, Eureka x 2 Bencubbin (W.470) and Celebration x Bobin (W.499), and several back-cross and semi-dwarf selections performed well.

High Rating of Falcon.—The crossbred (Gular x Dundee) x (Gular x Bencubbin (M.972)) again yielded well and has been registered and released as Falcon. The excellent yield and quality performances of Falcon have led to its ranking with Olympic and Heron as new standards, against which the future productions for southern New South Wales will be evaluated.

Breeding for Quality.—The initial work on granularity of wheat wholemeal has been published. This has demonstrated the marked difference in granularity of hard and soft wheats and has attracted considerable interest from the milling industry.

Further work on the inheritance of granularity and its significance in baking quality is proceeding.

Back-cross programmes to improve the quality of Bencubbin and Glenwari have been further advanced but the advent of newer high yielding varieties has reduced the importance of this work.

Breeding for Disease Resistance.—The programme to add stem rust resistance to Falcon is at the stage where homozygous resistant lines have been secured. These are being increased, for final assessment before release.

Selections from back-cross lines of Heron have been made. wherein loose smut resistance has been combined with resistance to stinking smut.

Genetic studies.—Following upon exploratory genetics studies at Wagga and as an outcome of discussions held with Rockfeller Foundation wheat breeders in Latin America, the general question of varietal adaptation in wheat is under additional study. This work involves participation in the Inter-American Spring Wheat Yield Nurseries, and the production and study of isogenic lines differing from their respective prototypes in vernalization and photoperiodic behaviour.

A high yielding late strain of Gabo has been produced. It is currently being evaluated. Mode of inheritance of maturity is being studied in this material.

Wheat Disease Studies

Straw Colonization by Helminthosporium sativum.—Further studies have established that strain isolates of this fungus, whether of saprophytic or parasitic origin, are equally limited in their ability to colonize wheat straw saprophytically in competition with the natural microflora of unsterilized soil.

This serves to confirm the view that *H. sativum* is a specialised parasite with restricted ability to persist in nature as a competitive saprophyte.

Effect of Cultural and Manurial Practices on Take-all in Wheat.—Preliminary data from field experiments indicate that stubble burning is more effective in reducing take-all losses in the second wheat crop in a pasture-wheat-wheat rotation than is ploughing-in of the straw residues.

On stubble burnt plots, deep ploughing (8 in.) proved no more effective than normal depth ploughing in reducing the incidence of the disease.

Evidence was again obtained of the take-all control value of superphosphate dressings, particularly at rates of 1 cwt./ acre and upwards.

Barley Yellow Dwarf Virus Disease.—This aphid-borne disease, which was first recorded in New South Wales in commerical cereal crops during the 1959-60 season, was widely distributed but of little economic importance in the southern wheat belt in 1960-61.

Investigations of B Y D V, initiated at this Institute in 1958 and subsequently pursued in collaboration with the C.S.I.R.O., have served to stimulate wide local interest in virus diseases of cereals and grasses. Interest in this hitherto neglected field has been further stimulated by the visit to this country in 1960 of world authority, Dr. J. T. Slykhuis of the Canada Department of Agriculture; and by the release of his subsequent report on incidence and distribution of this group of viruses and their insect vectors in Queensland, New South Wales, Victoria and South Australia.

Nickel Toxicity in Cereals.—Field and glasshouse studies have established that a chlorotic streak condition affecting the leaves of wheat and oats in localised areas in the Wallendbeen district is due to nickel toxicity. The condition, not previously recorded in this State, is restricted to soils characterised by presence of serpentine deposits.

Review Bulletin on Root and Foot Rots of Wheat.—In the terms of a resolution of the 1960 Commonwealth Conference on Root Rots of Wheat, Dr. F. C. Butler of this Institute has prepared a comprehensive review paper—"Root and foot rot diseases of wheat."

The review is to be published as a Science Bulletin in the departmental series. Funds for the purpose have been granted by the Wheat Industry Research Council.

Stem Rust Resistance of Wheat.—Collaborative work with the University of Sydney, the University of Saskatchewan and the Department of Agriculture, Canada, has led to a greater understanding of the value of known genes for stem rust resistance in wheat. Evidence has suggested that at least two alleles conditioning different rust reactions may occur at the Sr_9 locus.

Wheat Quality Investigations

Milling and Baking Quality Assessment of Breeders' Material.—Material from the wheat breeders' plots provides much useful information about both milling and baking characteristics. This is being used in the study of individual and more basic components of quality.

The routine quality work has been arranged to deal with all the wheat-quality breeding material in the period between harvest and sowing, to avoid unnecessary effort in resowing undesirable types of crossbreds.

Role of Physical Dough-Testing Equipment.—Baking quality has been assessed solely on the results of the controlled test-baking method, but the Institute's physical dough-testing equipment has also been used to indicate flour characteristics. The purpose of the latter is that at least some of the information gained from the physical dough test may eventually be used to support and perhaps eliminate subjectiveness associated with test baking.

Results from dough-testing equipment give useful information concerning some flour characteristics, but it has not yet been possible to interpret them in a way which will give a reliable indication of baking quality over the wide range of wheat types encountered in the breeding programme.

Effect of Protein Level on Baking Quality.—Decreasing protein levels causes a more rapid reduction in baking quality for some varieties than for others. In the quality assessment of crossbreds, preference is given to those which retain reasonable baking quality at the lower protein levels envisaged for this region. In this connection, the effect of protein level on the baking quality of several wheat types is being studied.

Varietal Differences in Starch Damage.—Experimental milling results from the use of both the Allis Chalmers and the Buhler laboratory mills show strong varietal differences. A study of these varietal differences and the degree of starch damage caused by variations in milling technique, and their effect on physical dough characteristics and baking quality, is continuing.

Nitrogen Metabolism.—The study of nitrogen metabolism in the wheat plant has been continued and extended. A method of nitrogen determination has been perfected. It involves direct nesslerization of Kjeldahl digests.

Experiments have been initiated to study the effect of protein content, premature harvest, and environment on the diastatic activity of a series of Australian wheat varieties.

Oat Improvement

New Varieties.—Further to the extensive grazing trials over the past six years, a new strain of Algerian has been released and recommended to replace the standard Algerian.

The crossbred M.1010, referred to in previous reports, again yielded well. Steps have been taken to register it as a new variety. In addition to high grazing and grain yields, it possesses good straw strength and grain quality and is smut resistant.

Yield Components.—This study has been continued. It is being used as a basis for a back-cross improvement programme.

Weed Investigations

Sekelton Weed.—Investigations have shown that reduced competition brought about by fallow-spraying tends to increase grain yields. Spraying in spring at the recommended time prevents yield loss by alleviating water stress. Weed control sprays must be applied both to the fallow and to the crop (in spring) to obtain maximum yield. Unfortunately, yield increases obtained by fallow spraying have been economic only in seasons of high rainfall.

The herbicides Amitrol and Diquat, which are inactivated more rapidly than 2,4-D in the soil, were as effective as 2,4-D when used as fallow sprays.

Autoecological studies in progress show that, while some seeds will germinate readily immediately the involucre recurves, others require a short period of after-ripening. There are indications that dormancy, which is broken by moist cold-pretreatment. sets in 12-15 days after seed release.

Black Oat, Wimmera Ryegrass Control.—Both of the herbicides Carbyne and Avadex show promise for control of black oats in the crop, but the former was relatively ineffective against Wimmera ryegrass. The higher application rates used damaged the crop.

Soil Fertility

Agronomic Survey.—Techniques to study, on a survey basis, problems associated with the cropping of clover ley country have been developed from two years' experience in the field.

In addition, a paddock study has been initiated to determine what intensity of sampling is required to arrive at reliable estimates of various crop and soil parameters.

During the 1960-61 harvest, eight paired crops (on comparable clover and non-clover ground) have been encountered. This has enabled the grain yield and quality effects of fertility build-up under clover leys to be demonstrated.

Mineral Nitrogen Availability in the Field.—The 1959 and 1960 study of seasonal availability of mineral nitrogen under field conditions, and its uptake by wheat, has been completed. Mineral nitrogen was present in the nitrate form. Ammonia-nitrogen levels remained very constant at levels of 1-2 p.p.m. during the growing season.

Results under the seasonal conditions experienced have indicated that an initially high level of available nitrogen, at sowing, decreases slowly during the winter months and then more rapidly into the spring growing period. At no time did there appear to be insufficient nitrogen for crop growth.

Detailed sampling has revealed that with warm conditions there was a flush of mineralization following rains of approximately an inch or better, and the released nitrogen was rapidly absorbed by the crop. A lag period, which appeared to be dependent on temperature, existed between rainfall and the peak mineralization level.

Relationship of Soil Moisture to Mineralization and Crop Response.—As a result of the apparent temperature-moisture effects on nitrogen mineralization, indicated in foregoing paragraphs, an experiment has been designed. This will study under field conditions the effect of varying soil moisture during the season on the pattern of nitrogen release and its uptake by the crop. The experiment will also enable certain agronomic observations on the effects of moisture on the behaviour of the crop—particularly its yield components.

DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS

State Marketing Bureau

Marketing Boards.—Five Marketing Boards, constituted under the Marketing of Primary Products Act, 1927-1956, continued to function. They are:—The Egg, Rice, Navy Bean, French Bean Seed and Wine Grapes Marketing Boards. The Navy Bean and French Bean Seed Boards are experiencing critical marketing difficulties.

Action to wind up the affairs of the Potato Marketing Board, in liquidation, is near finality.

Following the resignation of one of the ministerial nominees on the Rice Marketing Board, Mr. P. C. Druce, Principal Economics Research Officer of the Division, was appointed to the vacancy. Mr. M. R. Bellert, Bega District agronomist, was appointed to fill the vacancy for a ministerial nominee on the French Bean Seed Marketing Board.

Amendments to Regulations.—Regulations, under the Marketing of Primary Products Act, 1927-1956, relating to the Egg Marketing Board, were amended. The amendment requires egg producers, when delivering to the Board, to brand their cases as to whether the eggs are the product of mated or unmated flocks.

Polls and Elections.—Polls were necessary under the Act, for election of producers' representatives to the Egg and the Navy Bean Marketing Boards. The circumstances were:—

(*a*) Following the resignation of a member of the N.S.W. Egg Marketing Board, a by-election to fill the vacancy for the unexpired term of office;

(*b*) The triennial election of five producers' representatives to the Navy Bean Marketing Board.

In addition, as required under the N.S.W. Dried Fruits Act, 1939-1957, election of members to the N.S.W. Dried Fruits Board was carried out. The Act provides for election of four members; two representatives of growers of dried vine fruits and two of dried tree fruits.

Preliminary work has been done for the triennial election of producers' representatives to the Egg and the Rice Marketing Boards. Both elections are due during 1961-62.

Market Reports and Related Services.—As required under the Marketing of Primary Products Act, 1927-1956, the Division continued to collect and publish information on marketing of livestock, fruit, vegetables, farm produce, fish, dairy produce, cut flowers and certain processed products.

Daily reports covering trading operations at the various wholesale markets in the Sydney metropolitan area were prepared *for broadcasting* over the National network of the Australian Broadcasting Commission and several commercial radio stations; and for *publication* in the Division's *Daily Wholesale Price Quotations*—issued to newspapers, producers' organisations, commercial houses, periodicals, and Federal and State Government Departments and instrumentalities.

The collection of retail price figures was expanded. Additional localities are now visited and more commodities are covered. The latter now include fruit, vegetables, meat (beef, mutton and lamb) and fish.

The Weekly Marketing Notes have been maintained. This publication includes reports on the stock sales at Homebush (cattle, sheep and pigs), poultry sales (live weight), meat prices on the hook, and summarised reports on prices and supplies of fruit, vegetables, cut flowers, fish, grain, miscellaneous farm produce and processed products.

These Notes also include cold storage statistics—collected in respect of butter, cheese and fruit; and a series of monthly price averages for a comprehensive range of farm products; computed from Divisional records.

Stock feed prices on a wholesale and retail basis, and wholesale prices of dressed poultry were collected monthly.

Compilation of statistics relating to arrival and disposal of primary products at Sydney by rail and sea, both from interstate and intrastate sources, continued.

Inquiries concerning prices and market prospects, covering a large number of primary products, were received from a wide variety of local and overseas sources—State and Federal Departments, banks, processors, trade agencies, growers' organisations, and individual producers.

Crop Reviews and Forecasts.—This essential service continued. Forecasts of production were prepared for wheat, oats, citrus fruits and broom millet. The two regular monthly reports, *New South Wales Pastoral Conditions* and *Report on Production Trends*, were also continued without change.

Introducing the Farmer to a Farm Records Book

The Department publishes Records Books for mixed farmers, dairy-, fruit and vegetable-, and poultry-farmers. Economics Research officers have also established some group projects (e.g., the new Colleambally Irrigation Area) in which as many as 40 farmers in the locality are maintaining business-records of their respective farm operations and costs.

Meteorological Records.—This Division for some years has regularly recorded comprehensive meteorological records and related data. Advice and information were provided to various Divisions within the Department and also to members of the public. A Divisional officer acts as liaison officer between the Department and the Sydney Weather Bureau.

Economic Research

Shortage of Research Economists.—The Division's economic research programme, though considerable, was again restricted owing to staffing problems. The Economic Research Staff increased from the very low level of the previous year, but lack of experienced research officers is still the drawback.

Even so, some important projects were finalised and other major projects were commenced.

The main research projects either completed or in progress at the end of the year, are as follow:—

Economics of Pasture Improvement.—This important project has proceeded steadily. The major part of the field work has now been completed. It has involved collection of extensive physical and financial data from a sample of thirteen co-operating farmers in the Northern and Mid-western Regions.

The project aims to provide further basic information on the benefits of costs of pasture improvement under a variety of agricultural and economic conditions. It will be of considerable interest and value to extension workers.

In addition, the project has been designed as a means of studying new research methods. The analytical side of the study is being greatly assisted by the use of UTECOM and SILLIAC computors at the Universities of New South Wales and Sydney, respectively.

The results of this research study will be published during 1961-62.

Economics of Fertilizer Usage.—Arising from a project that involved economic analysis of a seed-superphosphate trial conducted at Berry by the Division of Plant Industry, a major research study on the economics of fertilizer usage has been developed.

The "production function approach" research technique is being used. It has considerable potential in the analysis of experiment results.

Until now, this technique has received only slight attention in Australia.

This study has already provided useful data for extension purposes. A detailed paper is being prepared for publication in the *Review of Marketing and Agricultural Economics.*

Socio-economic Study of the North Coast Dairy Industry.—One of the more important research projects commenced during the year is a study of the problems of low farm income and inefficient production which exist on a wide scale in the north coast dairying industry.

Grants under the terms of the Dairy Produce Research and Sales Promotion Act are financing this work.

An initial survey of a random sample of sixty dairy farms in the Richmond-Tweed region is in progress.

At the same time a statistical study of the agricultural industries of the Region is being made. The survey is directed towards obtaining details of costs, income, tenure arrangements and farm management practices; whilst the statistical study is aimed at reviewing long-term farm adjustments that are occurring in the region.

All field work on the initial survey has been completed, and a report is being prepared.

Farm Management Study, Nowra District.—This study was commenced in 1958. It has provided further useful information regarding dairy farm costs and returns on a series of properties within the Sydney Metropolitan Milk Zone.

Twenty dairy farmers co-operated in the study during 1959-60, and a full analysis of the final results has been published in roneoed form. This has been made available to participating farmers and to extension workers associated with the industry.

Dairy farmers continued to co-operate in this study during 1960-61. It will be continued in 1961-62, to provide further data for a more detailed study.

The Pattern of Industry Financial Assistance to Rural Research.—A survey of the implications and effects of funds made available for research by way of levies imposed on products sold by primary producers has been initiated.

The money coming from these taxes, together with the £-for-£ contribution of the Commonwealth Government, has grown to a stage where it represents a considerable proportion of the total funds available for agricultural research within Australia.

Since these funds represent so important a source of finance for research, for new and developed research units, the criteria and mechanism used in the allocation of these moneys appear to be having a signficant effect on research itself.

The need for a detailed study of the effects of this producer contribution to research is obvious.

Gosford Vegetable Growers' Management Survey.—A group of farmers from the Gosford Vegetable Growers' Association is co-operating in a recently commenced survey in the Gosford area.

Fifteen selected producers are keeping complete records, including a labour record, of their farming operations.

The records will assist the farmers individually and the Association as a whole, to analyse costs and returns, and to determine the most profitable combination of the various crops they can produce.

Marketing of Fat Lambs.—A preliminary study of factors affecting the supply and price of fat lambs has been done.

Although the officer responsible for this work has since resigned from the Division, he will continue to study the pattern of demand for lamb and other meats in his new position as Lecturer in Agricultural Marketing at the University of New England.

The initial study disclosed a marked seasonal price trend in fat lamb prices. This could under some circumstances be of practical help to producers.

Results of this preliminary study have been published in the *Review of Marketing and Agricultural Economics.*

Organisation of the Sydney Potato Trade.—Among the industries which have been subjected to economic analysis is the potato trade. A detailed study of the system of marketing potatoes in Sydney has been made and published.

From the study, it was concluded that the only solution to the problem of rising costs in the industry lies in the overall improvement of marketing methods in the several levels of distribution examined.

Farm Investment Study.—This project was initiated in 1960. It is designed to provide specific information on several aspects of land settlement, in relation to the accumulation of capital in farming and to the successful development of individual farms.

War Service Land Settlement properties are being used as a basis for the study.

The information obtained will help to delineate the factors important in successful establishment of settlements. It should also be valuable in separating the various factors involved in formulation of management decisions by farmers.

Coleambally Farm Record Project.—A record-keeping study has been commenced on the newly-developed Coleambally Irrigation Area. Settlers detailed records will be analysed at the end of the financial year.

The information obtained should be of value to future settlers in the area as well as in the formulation of settlement policy. As the staff position permits, the number of settlers participating in the project will be increased.

Trends in Land Use on Wheat-Sheep Farms.—A study of recent trends in the use of arable land in the New South Wales wheat belt was completed and published.

In the study period there were marked changes in the wool-wheat price ratio. There were also significant changes in the pattern of land use.

It would appear that these changes in land use can be explained largely by movements in the price relationship. This economic factor appears to have motivated similar production changes in both the southern and northern regions of the wheat belt.

Advisory, Educational, Extension and Publications

Policy Advice.—Part of the Division's functions has been to provide advice on economic policy affecting agriculture. It has also examined and advised on the position concerning imports and exports of coarse grains, protein concentrates and other farm requisites.

Quarterly Journal.—The Division since 1950 has regularly published its quarterly journal, the *Review of Marketing and Agricultural Economics.* A high standard has been maintained, notwithstanding difficulties through staff changes.

Extension Method Skills

The young sheep and wool officer has applied his in-service training in the use of audio- and visual-education aids. At this field day he has : platformed the ram, for everyone to see ; has summarised his advice on a blackboard, to supplement his talk ; is using a battery-operated amplifier ; and is wearing lapel-microphones, so that he may move about or use his hands in the demonstration whilst being heard conversationally

Papers from agricultural economists employed in other organisations are accepted for publication in this journal. In particular, the Faculty of Agricultural Economics, University of New England, has made use of the opportunity and submitted papers for publication.

Lectures at Extension Schools, etc.—Officers of the Division addressed numerous extension schools organised by the Department and by the Agricultural Bureau of New South Wales, other farmer organisations and universities.

Officers also addressed various professional societies and other organisations on economic aspects of the rural industries.

The demand for talks on economic subjects by officers of the Division, and generally for economic information, is increasing. The depleted staff position has made it impossible to comply with all requests.

Lecture Courses at Agricultural Colleges.—The Division has provided a lecturer in Agricultural Economics at Wagga Agricultural College since the inception of the College, and continued to do so in the past year. At the same time the lecturer in Agricultural Economics at Hawkesbury Agricultural College has been assisted.

Individual officers of the Division have been responsible for examining in Agricultural Economics at each of these colleges.

Report on Meat Marketing in North America.—Following his return in July, 1960, from a study tour of the U.S.A. and Canada the Chief of the Division presented a comprehensive report on the marketing of meat in North America.

Representation in Committees

The Division provides the Executive Officer of the State FAO Committee. In addition, officers acted as Departmental representatives in the State Nutrition Committee, the Markets Advisory Committee, the State Mapping Committee and the Economics and Land Use Committees of the Hunter Valley Research Foundation. An officer also acted in the Inter-Departmental Committee to Investigate Rural Credit Facilities. The Principal Economics Research Officer acted as honorary Federal Treasurer of the Australian Agricultural Economics Society in 1960.

DIVISION OF INFORMATION SERVICES

Editing Services

Publications Range.—The following range of publications was served: the monthly *Agricultural Gazette of N.S.W.*, monhly *Poultry Notes*, bi-monthly *Dairy Topics*, and weekly *Press Copy*, roneoed press releases, reprints, revisions, and additions in the range of near to 700 miscellaneous booklets, pamphlets, brochures, precis for handbooks, programmes, reports, etc., for some of the short-term schools-courses and conferences, and the Annual Report of the Department.

Agricultural Gazette of N.S.W.—Circulation of this monthly farmer journal (96 pp., illus., incl. 42 pp. adverts and colour cover) increased from 34,900 to 35,750 copies per month.

Poultry Notes.—Circulation of this "special" for the poultry industry dropped from 5,900 to 5,800 per month, as a result of mailing list revisions.

Dairy Topics.—The May-June, 1961, issue of this dairy farmer bi-monthly journal, financed by the Dairy Industry Extension Grant, went to 18,350 addresses, 200 less than twelve months earlier—a result of mailing list revisions.

Press Copy.—Circulation of this weekly broadsheet was in the vicinity of 1,200. Primarily the contents are for possible use by the 400 newspapers and radio stations in the mailing list. There were 506 articles in the 52 issues (471 in the preceding year), and 19 illustrations (24 in the preceding year). The 506 articles included 40 of special interest to women or the farm family.

Stereo Loans to Newspapers.—Seventy-six stereos of blocks in the *Press Copy* were borrowed by newspapers (139 in the preceding year). Rural newspapers now call on this service less than in the past. Block-making facilities in rural newspaper establishments have increased and more photographs are directly available from Regional and District offices of the Department.

Booklets, Pamphlets, etc.—This year 232 miscellaneous publications were sent to the Printer after editing attention, 54 more than in 1959-60, and 213 were received from the Printer, 103 more than in 1959-60.

Roneoed Press Releases.—Forty-one (60 less than in 1959-60) were stencilled, roneoed and despatched. This source of press release has been less each year since 1957. Flow from the Ministerial office has largely determined this.

"Weeds" and "Pastures", Farmer Handbook Volumes.—Manuscript for the "Pastures" volume was completed in June, 1961, by the compiler—Mr. J. N. Whittet, H.D.A., retired Principal Agronomist (Pastures). It has yet to be processed by the Editing Section prior to despatch to the Printer.

The "Weeds" volume (374 pp., 82 col. plates, plus bl. and wh. illus.)—compiled by Mr. J. N. Whittet—was on sale (42s.) by December, 1959. Near to 80 per cent. of 5,000 copies in the first edition have now been dispersed. Revenue from sales since December 1959 is £6,777.

Compilation and production of the two *Farmer Handbook* volumes was financed by the Commonwealth Extension Services Grant. Revenue from the sales has been credited to a special account to re-imburse the Grant funds.

Colour-plate Insect Pest Pamphlets.—The series of single-sheet pamphlets (on one side, the life cycle of the pest, in colour, and on the reverse side the control measures) has been continued to a total of thirty-seven. The final fifteen have been edited and sent for printing. This completes the series.

Distribution of the first eight commenced in June, 1959. There are now twenty-two in distribution, and 49,196 leaflets have been issued.

Annual Report of the Department.—The manuscript was tabled in Parliament by the Minister and ordered for printing on 4th October, 1960. The printed Report (700 copies, 140 pp., illus.) came from the Printer in June, 1961. It has been distributed to appropriate institutions in many countries.—as an abridged account of this Department's activities.

Advertising Revenue.—Net revenue from sale of space in the *Agricultural Gazette of N.S.W.* has been estimated at more than £11,000. In the preceding year it exceeded £12,000, but thirteen issues appeared and were taken into account in that year. Further, a changeover in advertising representative occurred in 1960. This jolted the space sales programme. Unsold space was filled to advantage by advertising Departmental services and publications.

Publications Distribution and Enquiry Section

Enquiry Statistics.—Excluding those handled by the Home Gardens Enquiry Officer (6,822 reported in a later paragraph) this Section, with the aid of literature on hand for distribution, handled 77,632 requests for information (by letter, by 'phone, or in-person). No record was kept of the several thousand in-person requests at the Department's Information Bureau in the Agricultural Pavilion of the Sydney Royal Show (serviced for ten days, eight nights).

Publications Distribution.—Some 791,600 publications were distributed, including 274,400 parcelled and despatched to country offices for local distribution in response to enquiries.

Saleable Publications, Revenue.—"Weeds" book sales totalled 1,361, for £2,341, and sales of other publications totalled 3,026, for £800; in all, 4,387 sale items—for £3,141. Some 99 per cent. of the Department's 700 publications are free.

The foregoing paragraph has not taken into account sales from the Government Printer office nor revenue from *Agricultural Gazette of N.S.W.* subscriptions (12s. 0d. p.a.). Whilst the great majority of Gazettes are complimentary, to farmers in the main, there is a subscription list. It is maintained by the Printer's office.

Home Garden Enquiry Officer's Service.—The H.G.E.O. stationed in the Enquiry Counter Section handled 6,822 enquiries (by letter, by 'phone, or in-person). These were such as, in his absence, would have had to be referred to various technical sections of the Department by enquiry-counter office assistants—because available literature would not have met the respective case.

Library Services

Accession Statistics.—Some 18,295 items were accessioned; compared with 13,823 in 1959-60 and 14,383 in 1958-59.

Books accessioned	750
Periodicals accessioned	12,500
Pamphlets, Reports, etc., accessioned ..	5,045
Total accessioned	18,295

Of the 750 new books, 150 were acquired with Commonwealth Extension Services Grant funds, for location in country offices. There are now select collections of reference books at 73 country offices, comprising 1,483 books.

Agricultural Colleges' Book Purchases.—In addition to the aforementioned, forty-four books for Wagga and 206 books and five periodicals for Hawkesbury Agricultural College libraries were ordered against the special trust accounts (student subscriptions) established at those two institutions.

Central Library Loans.—31,923 items were loaned; compared with 28,294 in 1959-60 and 28,754 in 1958-59.

Periodicals circulated .	26,586 (av. 511 per week)
Miscellaneous loans . .	5,337 (av. 102 per week)

Periodical "Select List of Publications Received".—Four issues of this list were compiled and sent to all appropriate officers/offices. They comprised, in total, 100 foolscap pages of classified references.

Photo-copying Service.—480 jobs were completed, involving 4,389 sheets; as against 432 jobs, 4,851 sheets in 1959-60.

Reference Work and Literature Searches.—These activities were undertaken for Departmetal staff, external organisations and the public. The resultant bibliographics have been sent to those who have requested them but in addition an enquiry file has been established for the copies—to keep all such lists together. A system of subject cards has also been initiated, in the Library's catalogue, to facilitate future reference and to avoid duplication of search effort.

List of Australian Books and Periodicals on Agriculture.—Such a list was prepared, processed, and widely disseminated to officers of the Department throughout the State. It will be kept up to date, and a central file on cards is now maintained in the head office library.

A Count of Collections.—The Australian Advisory Council on Bibliographical Services recently promoted a Survey of Library Resources. In response to this the Department of Agriculture library count revealed that (in all of the Department's libraries) there were (as at 31st May, 1961) 18,056 books, 26,983 volumes of periodicals, and 120,062 pamphlets.

Inter-Library Loans.—Co-operation with other institutions' libraries continued, and once again more was loaned than was borrowed. Typically large borrowers included the Colonial Sugar Refining Company, the C.S.I.R.O., the Departments of Agriculture in other States, the three Universities in New South Wales, and the New South Wales Departments of Conservation and Public Health.

Display Art/Designing Services

Show Exhibits.—Agricultural Show displays by field officers at twenty country centres were assisted—by signs, artwork, ticketwriting, graphs, and/or by loan of equipment comprising propomats (automatic projectors), transparencies, etc.

Two major Show efforts were the Department's display bays respectively at the Sydney Royal Show and the Science Sheep Show.

Aid to Editing Section.—The display artist helped the Editing Section with layouts and finished art-work—line and tone, photographic retouchings, cover designs, graphs, etc.

Photographic Aids Services, Cine and Still

Field Officers' 35-mm. Photography.—9,040 colour and 6,270 black and white 35-mm. transparencies for use in extension work were acquired through field officers' camera activities. There are now 127 x 35 mm. cameras in the Department's photographic system; and more than 90 per cent. of them are in country offices.

Tutorial and Allied Advice on Photographic Matters.—All cassettes of film officially exposed by Departmental officers have flowed through this Division's photographic aids section en route to processing and en route back to the respective camera user. In the course of this "traffic" the photographic aids officer has sent 661 letters to camera users, and an estimated two-thirds of these have included tutorial photographic advice.

In addition, photographic teaching sessions have been provided at extension methods training schools and at rural offices.

Prints to Illustrate Publications, Reports, Records.—3,240 prints were made for these purposes; compared with 1,828 in 1959-60.

Assignment Photography for "Pastures" Handbook.—More than 400 photographs were taken for the "Pastures" volume in the Farmer Handbook series. These were processed, and page-mounted as block-copy.

Special-purpose Sequences of 35-mm. Slides.—Some of the sequences prepared on assignment were "Economics Research for the Sheep and Wool Industry", "Growth Stages of Weeds", "Harvest of Certified Seed, and Seed Testing", "Herd Recorders' Equipment", "Fodder Conservation (Silage)", "Sheep Blowfly Breeding Experiments", and "Irrigation at Narrabri Experiment Farm".

Use of Photographic Aids in Show Displays.—The Sydney Royal Show, the Science Sheep Show, and field officers' exhibits at some twenty rural Shows were assisted by enlargement (12 in. x 10 in. or 23 in. x 17 in.) prints or transparencies, or by collation of 35-mm. transparency series.

Central Photographic Collection.—240 new entries, selected from field officers' camera results, were made in the central library of photographs.

16-mm. Cine Film Work.—The "T.B. in Cattle" film was completed, and approved for general release.

Production assistance was given in respect of the following films in production for the Commonwealth Department of Primary Industry: "Infertility in Cattle", "Sheep Nutrition and Pasture Utilization (The Shannon Vale Story)", and "Maintenance of the Cream Separator".

Cine Film Library

Films Total.—Thirteen titles (eighteen prints) were added, bringing the film library total to 233 titles.

Liaison with Other Film Libraries.—The Department's film holdings have been supplemented in extension service, by films from other libraries. To this end, liaison has been maintained with the New South Wales Film Council and the various Consulates, Information Offices, and commercial films that have film holdings. Many of the rural offices and the Agricultural Bureau branches are also registered direct borrowers from the New South Wales Film Council, the largest film library in New South Wales.

Film Programmes Collated and Loaned.—In the course of this service to more than 100 rural centres—field offices of the Department (for farmer meetings) and Agricultural Bureau meetings (direct)—1,151 films were used in 521 programme collations. The loan service gave rise to 854,205 ft. of film checking/repair work.

Film Appraisal Screenings.—The Division arranged twenty-four appraisal screenings. These give to subject-matter specialists of various technical Divisions the chance to assess the extension potential of newly-available films; or to decide the conditions that shall apply to use of the respectve film; or to exclude it from Departmental programmes.

Radio in Extension Service

Rural Radio Stations' Farm Broadcasts.—Thirty-eight rural Stations now have farm radio sessions to which Department of Agriculture field officers regularly contribute material—at least once a week. In excess of 4,000 broadcasts in New South Wales in 1959-60 included Department of Agriculture material. Some Stations have involved Departmental officers twice and other thrice weekly.

Tutorial and Allied Advice.—The Extension Officer (Radio) has visited six of the nine Agricultural Regions for tutorial work amongst field officers, advice to newly appointed Regional publicity officers, and, liaison discussions with staff of radio stations. He has also presented teaching sessions on radio technique at extension methods schools.

Tape Recording from Head Office.—Sixty-four tape recorded interviews and talks that featured subject-matter specialists were made at head office for loan to field officers for use in local programmes. The policy of minimised volume of Sydney-made recordings was sustained, to keep the emphasis on "local material, from local stations".

Equipment Increases.—Ten new "broadcast quality" tape recorders were acquired for country offices, to replace aged and lower-quality recorders.

Regional Publicity Officers

The nine Regional publicity officers, one attached to headquarters of each of the nine Agricultural Regions, were transferred in April, 1961, from Division of Information Services establishment to the Regional Extension Services administration.

They have continued the functions typical of the work they did whilst they were decentralised officers of the Division of Information Services. In short, they have processed material, or assisted field officers of technical Divisions to prepare it, for press and radio usage, and for agricultural Shows; have organised chances for field officers to use radio and the press and farmer meetings; have helped farmer organisations—especially the Agricultural Bureau councils and branches—to programme, publicise, and fulfil extension activities; and, in general, have encouraged the interest and developed the skills of field officers in using mass and group media of extension service.

The Agricultural Bureau ("Extension Groups")

Staff Increase.—The organiser staff was doubled; from two to four. The two new officers are University graduates in Agricultural Science.

New Branches.—Ten new branches of the Agricultural Bureau were inaugurated.

Affiliation of Branches.—At 30th June, 1961, 148 Agricultural Bureau branches were financially affiliated with their State Advisory Council; plus eight local Extension Groups in the Murrumbidgee Irrigation Areas (affiliated with the Agricultural Bureau State Council through their M.I.A. District Council of Extension Groups). There were 191 active Bureau branches in the mailing list. Each of the forty-three financially unaffiliated branches continued to be active in extension work.

Bureau Divisions in the Advisory Council.—Fifteen of the nineteen geographic Divisions were again represented in the State Advisory Council of the Agricultural Bureau. The Upper Murray, Central Murray, Illawarra and New England Divisions lacked the branch numerical strength to be represted.

The Advisory Council comprised nineteen members—the fifteen Divisional Councillors, two Women Councillors (one for the West and one for the East of the State), the State President and Vice-President. They held four meetings, and attendances averaged four-fifths of the maximum.

Revision of Boundaries, to Coincide with Agricultural Regions.—Boundaries, and system of representation in the State Advisory Council, have been revised by State Congress of the Agricultural Bureau—and approved by the Minister. The new provisions will operate from July, 1961. They provide ten Regions of the Agricultural Bureau; nine of these correspond by name and by area with the nine Agricultural Regions defined by the Department for decentralised administration of extension services. The tenth Agricultural Bureau Region is the Cumberland-Central Coast area which for Department of Agriculture extension staff purposes is administered from head office of the Department.

Each of the ten Agricultural Bureau Regions will have two Divisions. Each of the twenty Divisions may elect and be represented by a Councillor in the State Advisory Council of the Agricultural Bureau.

State Congress, and Divisional Conventions.—The Agricultural Bureau Jubilee Year State Congress was held at Hawkesbury Agricultural College in July, 1960. It was officially opened by His Excellency the High Commissioner for the United Kingdom, Lieutenant-General Sir William Oliver. Some 300 delegates and visitors took part in the three-day programme of lectures, demonstrations, discussions.

Ten Agricultural Bureau Divisions conducted an annual Convention; four were of two-days duration and the others were one-day. Attendances ranged from 120 to 200 men and women.

Branch Activities.—Most of the active branches met at monthly intervals. Their typical range of activities, in most cases programmed at the outset of the respective branch-year, comprised lectures/discussions/questions nights/film screenings and organisation of field trials, demonstrations and field days.

Whilst agriculture dominated the branches' programmes, a wide range of other topics added variety and cultural value.

Almost every branch arranged one or more field days. The discernible trend has been towards more half-day, and more farm-walk types of field event—with emphasis on a single subject. Some branches this year respectively organised a *series* of single-subject field days to meet local needs.

In the period 1957 to 1959, a programme-planning technique comprising the listing and sorting of local "needs"—followed by an allocation of priorities for attention to those needs—has been developed amongst the branches of the professional organising staff. The year 1960-61 has seen a marked increase in the application of this "extension programme" approach by branches. A direct result has been more pertinent and purposeful branch activity.

Agricultural Bureau Short-term Schools and Courses.—Bureau members and organiser staff promoted: two *Rural Leadership Schools* (five days for men, twenty-three attended; and seven days for women, thirty-seven attended) five other schools of a few days duration (*"Irrigation"*, at Forbes, *"Beef Cattle"*, at Gunnedah; *"Shearing"*, at Ariah Park and at Wallabadah; and *"Home Management"*, at Bathurst); and six courses comprising one night per week for five to six weeks (*"Soils and Botany Fundaments"*, at Moree and at Coffs Harbour; *"Pasture Management"*, at Wyong; *"Plant Nutrition and Pasture Management"*, at Dorrigo; *"Farm Management"*, at Narrabri; and *"Foods and Human Nutrition"*, at Wyong).

In addition, some branches conducted short-term schools or courses at locality level without drawing any help from head office; and in other cases Bureau branch members helped to organise schools and courses promoted in the name of the Department of Agriculture or one or other of the Universities.

Department of Agriculture officers co-operated in organising most of the schools and courses, and in the lecturing. Lecturers were drawn also from the Universities and from commercial organisations.

Bureau Scholarship at Hawkesbury.—The Advisory Council continued the Agricultural Bureau Scholarship Award at Hawkesbury Agricultural College, at an annual cost of £170.

Junior Farmer State Maize Growing Trophy.—The Advisory Council awarded a trophy for the Junior Farmer Clubs State Maize Growing Championship.

Beef Cattle Breeder Competition.—The 1960-61 event drew 217 entries—ten more than in 1959-60, and the highest for the nine years of the competition. The State Judge reported the 1960-61 standard of entry to be such that any of this year's District Finalists would have been good enough to win the State title a few years ago. The competition is reported as having done a lot to raise the quality of beef cattle on mixed farms in New South Wales. A potent factor has been the promotion of field days, associated with the judgings and judges' comments at district level.

Women's Extension Service

Staff Increase.—Two professional officers have been added to this Section, so the Women's Extension Service staff now comprises a Senior Extension Officer (Women's Service) and two Extension Officers (Women's Service).

Agricultural Bureau Women.—Women's sessions at Agricultural Bureau branch meetings, branch field days, Divisional Conventions and Field Days, and State Congress, continued as the main channel through which the Women's Extension Service assisted rural women.

Other Women's Organisation.—Supplementary channels of contact and service were maintained, through the Country Women's Association, Farmers' and Settlers' Association, Association of Commercial Apiarists, Junior Farmer Clubs' senior girls, Church groups, Outward Bound Movement for Girls, and other bodies. The Senior Extension Officer is also serving in the Women's Committee for the World Poultry Science Congress to be held in Sydney in July, 1962.

Help to Field Officers, and Experiment Station Field Days.—By personal participation or by suggesting and/or organising other speakers or demonstrators, the Women's Extension Service officers assisted field officers and Experiment Station managers to promote women's sessions at farm field days.

Subject-matter Trends, and Sources of Help.—To meet the growing interest of rural women in their more technical problems, and in consumer education, and human relations, the Women's Service has sought and received the help of Technical College and University of New South Wales staff.

officers of the Department of Health, manufacturers, advisory staff of trade associations and public utilities, migrants, officers of Embassies and Consulates, Country Women's Association handicraft specialists, officers of the New South Wales Bush Nursing Association, and others.

Mass Media.—Women's interest articles were prepared for 40 of the 52 weekly issues of the Department's broadsheet *Press Copy*. Thirty taped recordings were made in head office by the Women's Service, for loans to field officers for use in local farm radio sessions. Taped recordings by other authorities, for example the Sydney Building Information Centre, were also arranged—for similar distribution.

Short-term Schools/Courses.—The completed projects included a three-days' residential school on *Home Management* at Bathurst, attended by 24 women; a *Foods and Human Nutrition course* (one day per week for five weeks) at Wyong, attended by 29 women; and a *Rural Women's Leadership* School at Newport (7 days, 37 women in residence). Requests and preliminary organisation are in hand for several more such group activities.

Associated Country Women of the World.—The Senior Extension Officer (Women's Service) is Agricultural Bureau of New South Wales women's representative in the Australian Co-ordinating Committee for the 10th Triennial Conference of A.C.W.W.—to occur in October, 1962, at Melbourne.

Short-term Schools and Courses, in General

The Division of Information Services establishment includes a specialist officer designated "Extension Officer (Organiser of Short-term Schools/Courses)".

He has given organiser-assistance to any section of the Department that required his help in promoting a school programme, publicising the event, drawing and enrolling attendance, drawing upon lecturer/demonstration assistance from other institutions, editing precis for handbooks, and/or supervising the execution of a school.

In those directions, he has in 1959-60 assisted schools conducted at Hawkesbury Agricultural College, Wagga Agricultural College, Yanco Agricultural Research Station, Newport, and at country towns within the various Agricultural Regions or Agricultural Bureau Divisions.

Twenty-seven short-term schools and eight courses were conducted by, or in association with, the Department of Agriculture during the year. More than 1,300 rural men and women participated in them. Departmental officers also accepted lecturing and/or organising relationships with a number of schools promoted by other institutions or farmer associations.

Extension Service/Methods Training

Pre-service Training Schools.—The Division of Information Services organised, and provided the tutorial staff for three pre-service training schools:—

(i) A residential, Extension Service/Methods School (6 days) for University of Sydney, 2nd Year Agriculture students.

(ii) A residential, Extension Service/Methods School (6 days) for University of New England, 2nd Year Rural Science and 2nd Year Agricultural Economics students.

(iii) A residential, Extension Service/Methods School (5 days) for Wagga Agricultural College, 1st Year students.

In-service Training School.—The Division similarly provided the annual, residential Extension Service/Methods school (11 days) for Department of Agriculture officers and Department of Education Junior Farmer Club supervisors. Forty-eight officers were in residence.

Extension Service/Methods Examinations

Examinations for Higher Salary Grades.—Sixteen field officers, candidates for promotion from Grade II to Grade III salaries, submitted themselves for written examination by the Chief, Division of Information Services in "Extension Service", as required by the Public Service Board.

Field Officers' Essays.—Fifty-nine essays, by 24 field officers, candidates for promotion within the Grade I and Grade II salary ranges, were examined by the Chief, Division of Information Services, for "clarity and quality of expression." The essays were also treated as vehicles for "correspondence teaching", and field officers' comments have indicated that they accepted them as such.

Representation in Various Organisations

The Divisional Chief continued to represent agriculture in two State agencies affecting adult education, viz., the N.S.W. Film Council, and the N.S.W. Advisory Board of Adult Education.

The Agricultural Bureau Organiser represented the Bureau in the State Council of Junior Farmer Clubs, and the Whole Milk Zone Dairy Farmers Advisory Committee.

The Senior Extension Officer (Women's Service) represented Agricultural Bureau women in the Council of the N.S.W. Bush Nursing Association, and in the planning bodies for, respectively, the 1962 World Poultry Science Congress—Sydney, and the 1962 Associated Country Women of the World Triennial Conference—Melbourne.

REGIONAL EXTENSION SERVICES

There are nine Agricultural Regions; for decentralised administration of the extension and regularity activities (excluding veterinary services) of the Department of Agriculture. In each the staff are under the immediate direction of a Regional Supervisor. All are in the Eastern and Central Divisions of the State. Each Region is an aggregate of shires. The number of primary producers per Region ranges from 5,000 to 9,000.

Personnel in Regions

There are 321 officers located in country districts for advisory, regulatory and similar services to primary producers; excluding the staff of the two Agricultural Colleges, the Agricultural Research Institute, Wagga, the Veterinary Research Station, Glenfield, the 18 Research Stations and Experiment Farms, and the veterinary officers.

Office Accommodation

There are 47 country offices in the nine Regions. Their standard of accommodation is now very satisfactory, with few exceptions—and arrangements are in hand for the latter.

New accommodation has been occupied at Orange, Dubbo, Nowra, Cooma, Casino and Cootamundra. At seven other centres new buildings or newly renovated accommodation are proposed or under construction. At four centres additional rooms have been occupied, and at two others existing accommodation has been renovated.

Agricultural Bureau Liaison

In addition to organising short-term schools in liaison with Divisions or Branches of the Bureau, officers helped to arrange programmes for Bureau branches—they meet twelve times per year, arranged demonstrations in respect of crops, pastures, and stock, and field days arising from the demonstration projects.

North Coast Region.—The rapid development of the Agricultural Bureau continued in the North Coast Region, where five more new branches were formed. The Bureau branch total in this Region is now 33; as against six active branches there when the Region was established in 1952. Not only were new branches formed, but Regional officers organised and otherwise assisted with one short-term school, two courses, and two conventions for branches and Divisions of the Bureau.

Mid-Western Region.—Two more new branches were formed and the ground was prepared for another two. There are now 24 active branches of the Agricultural Bureau in this Region. A very successful short-term school on Irrigation was organised in association with Bureau branches.

Field Personnel in Agricultural Regions, under Regional Supervision

Type of Officer	In Rural Areas	Not in Regions	In Regions									
			Total	Southern	North Coast	Western	South Coast and Tablelands	South-Western	Northern	Mid Coast and Hunter	Mid-Western	North Western
Regional Supervisor	9	..	9	1	1	1	1	1	1	1	1	1
Agronomist (Extension)	38	2	36	4	4	4	4	7	4	3	3	3
Agronomist (Research)	3	1	2	..	..	..	..	..	..	2	..	..
Livestock Officer (Sheep & Wool)	18	3	15	2	..	2	2	2	2	..	3	2
Livestock Officer (Pigs)	5	..	5	..	2	1	..	..	1	1	..	..
Livestock Officer (Poultry)	3	1	2	1	..	..	..	..	1	..	..	..
Livestock Officer (Beef Cattle)	4	..	4	1	1	1	..	..	..	..	..	1
Livestock Officer (Apiculture)	3	..	3	1	..	1	..	..	1	..	..	..
Dairy Officer (Extension)	31	1	30	3	12	2	4	2	1	6	..	..
Dairy Officer (Livestock)	1	..	1	..	1	..	..	..	..	..	..	..
Fruit Officer	18	7	11	1	3	1	..	4	1	..	1	..
Entomologist	2	..	2	..	1	1	..	..	..	..	..	..
Pathologist	1	..	1	..	1	..	..	..	..	..	..	..
Publicity Officer	9	..	9	1	1	1	1	1	1	1	1	1
Italian Liaison Officer	1	..	1	..	..	..	..	1	..	..	..	..
Survey Officer (Milking Machines)	5	1	4	1	2	..	..	..	..	1	..	..
Seed Certification Officer	6	..	6	2	..	..	3	..	..	1	..	..
Demonstrator (Farm Machinery)	1	..	1	..	..	..	..	..	1	..	..	..
Fruit Inspector	39	13	26	3	9	3	1	6	2	1	1	..
Herd Organiser	8	1	7	1	3	..	1	..	..	2	..	..
Field Assistant (D.I.E.G.)	6	..	6	..	3	..	2	..	..	1	..	..
Field Assistant (D. of A.)	10	1	9	1	1	1	..	4	..	2	..	..
Field Assistant (A.E.G.)	20	2	18	2	1	3	2	3	3	1	1	2
Herd Recorder	80	9	71	6	23	1	15	6	1	19	..	..
Total	321	42	279	31	69	23	36	37	20	42	11	10

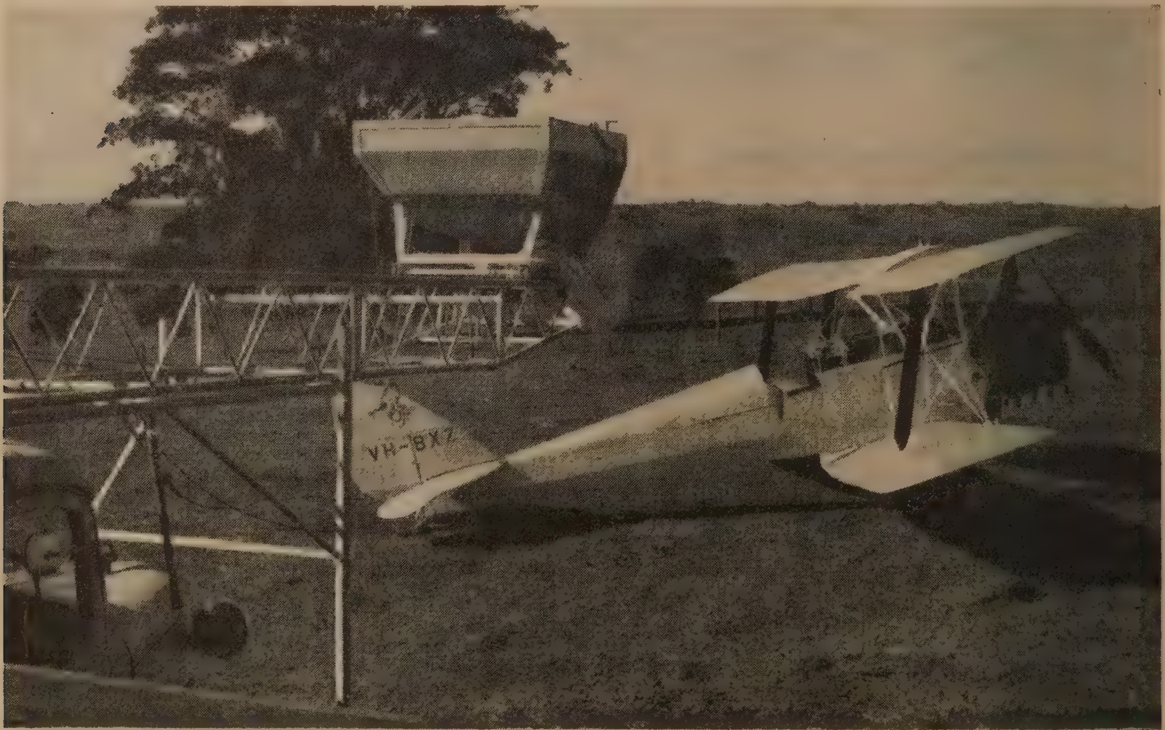
Western Region.—The Agricultural Bureau for many years has been very active in this Region. One new branch was formed. In addition to many Bureau field days and lectures, Regional officers assisted the Bureau to organise two conventions, a Jubilee Dinner, several agricultural "question and answer" sessions, and a school for Bureau women—on "management in the home".

Schools, Conferences, Field Days and Conventions

Conventions, refresher schools and courses, of two to three days duration, continued to increase in popularity with the farming community. There were twenty such farmer schools and courses, and thirteen conferences and conventions in which Regional officers participated this year. At least 350 field days, attended by more than 14,500 people, were conducted in Regions; and eighteen exhibits were staged at country shows. The field day attendance figure obviously does not include the estimated 40,000 people who patronised the three days of the Orange National Field Day. Regional officers played a prominent part in that too.

South Coast and Tablelands Region.—Two very successful schools were organised. A four-day "Stock and Pasture Husbandry" School at Cooma attracted more than eighty landholders, and a two-day Refresher Course, on "Weeds", at Bega, for officers of Local Government bodies and other appropriate organisations was attended by more than forty personnel.

Two Machinery Field Days were held. The annual two-day Southern Tablelands Exhibition, held at Goulburn and organised by a joint Committee including the Department of Agriculture, was attended by about 1,000 people. The Illawarra Machinery Field Day at Nowra was organised by the Nowra Lions Club and the District dairy officer.



North Coast Trial of Aerial Top-dressing

Aerial top-dressing of pastures was done in the North Coast Agricultural Region this year for the first time. Here the plane is about to be loaded from a truck-borne hopper.

Southern Region.—The first decentralised "School for Amateur Beekeepers" conducted by the Department of Agriculture was held at Albury, and eighteen beekeepers attended.

Successful "Pasture and Animal Husbandry" Schools were conducted, respectively at Gundagai and Tooma; the former in conjunction with the Shire Council, the Show Society, Rotary and Apex Clubs, and the latter in co-operation with a group of local farmers and graziers. The Region also co-operated with locality groups in conducting two Shearing Schools. A successful Conference of Extension and Regulatory Officers, and another on Noxious Weeds were held. The Regional Supervisor was Chairman of an Interstate Weeds Conference, at Albury.

South-western Region.—A three-day "Sheep and Pasture School", for graziers, was held at Hillston. This School, the first of its kind to cater specially for Western Division graziers was attended by 150 people. They travelled long distances by car and private aeroplane, from centres as widely separated as Bourke, Wentworth, Wilcannia and Ivanhoe. This School was so successful that enquiries were immediately raised for conduct of a similar school at Hay in the forthcoming year.

Mid Western Region.—A Conference of Extension Officers was held at Cowra. Four Weed Conventions were conducted, with a total attendance of over 100 farmers. An "Irrigation School" at Forbes was successful, despite flooding along the Lachlan River at the time. A successful Shearing School was held at Grenfell. Fifty-one field days and conventions were organised, attended by a total of 2,250 farmers. Extension officers delivered lectures to farmers' organisation on 60 occasions, with a total attendance of 1,500 people.

Western Region.—Regional officers provided a day's sessions on aspects of sheep management at Warren, at a school organised by the Australian Estates Company for their managers and overseers. A Bathurst school for women on "Management in the Home", had an attendance of twenty-six. Regional officers assisted with publicity in organising one of the most successful field days ever staged in New South Wales. This was the Trangie Agricultural Research Station Field Day. The topic was the Merino Sheep Improvement Work proceeding at this Station. The attendance, approximately 2,000 from all over New South Wales, included many prominent Stud Breeders.

Mid Coast and Hunter Region.—Regional officers assisted in the organisation of three successful Machinery Field Days, respectively at Muswellbrook, Maitland and Taree.

North Coast Region.—Regional officers organised two successful courses for farmers and participated in a "Tropical Fruits and Small Crops" School for junior farmers. They also participated in conferences on Hybrid Maize Seed Certification, Legume Inoculum, and of Officers of the Division or Horticulture.

Northern Region.—One hundred farmers attended a Regional School at Warialda on "Primary Industry Development". Officers conducted the Third Annual Weeds Refresher Course at Tamworth for members of Local Government bodies and other personnel. Regional officers participated in eighty-five field days.

North-western Region.—Two successful schools, a Beef Cattle (attendance sixty) and a Shearing School were organised, as well as a "Soils and Botany" Course. Regional officers participated in a Skeleton Weed Conference, the staging of two show exhibits, and in forty field days.

Regional Publicity—Press and Radio

The work of the Publicity officers, one in each of the nine Regions, was a prominent factor in dissemination of agricultural information to primary producers—per medium of press and radio. In the nine Regions a total of over 500 hours, over commercial and Australian Broadcasting Commission stations was utilised by Departmental officers; and 2,250 publicity statements were issued to rural newspapers and radio stations.

North Coast Region.—Regional officers provided the items for regular farm sessions on the three commercial and three A.B.C. radio stations in the Region. These programmes, together with individual items, occupied over 100 hours during the year. Some 270 individual items were released to press and radio stations in the form of publicity statements, and a feature of this form of publicity in the North Coast Region was the use of photographs to illustrate items. Photographs published in the various newspapers averaged ten per month.

Mid Western Region.—Although the number of extension officers in the Mid Western Region is comparatively small, a total of 93 hours of radio time was occupied; compared with 95½ hours in the previous year. In all, 817 individual recordings or items were used; compared with 692 in 1959-60 and 446 in 1958-59. These figures are particularly significant as there are only two commercial radio stations in the Region. The Mid Western staff also utilised regularly a session on an A.B.C. station in the Western Region; and some of the items so used were also broadcast over commercial stations in other Regions. Some 426 publicity statements were issued, with a total distribution of 18,000.

Northern Region.—The total time occupied in broadcasting was 64 hours; and involved 180 programmes, including straight talks and interviews—in all, more than 700 items.

Mid Coast and Hunter Region.—The total radio time decreased from 85, for the previous year, to 63 hours. This was deliberate. An improvement in presentation and a better selection of subject matter yielded more effective use of the time offered.

Regional Advisory Committees

The Regional Supervisor in each Region is Chairman of a Committee established by the Minister for Agriculture to advise him on matters of agricultural interest, particularly those pertaining to the Region. Twenty meetings of the Committees were held, and many important topics relating to Agricultural Extension and primary production were discussed.

The scope of the Committees' work was broadened by a request from the Minister for Agriculture that they discuss and advise him on problems which in their opinion warrant research attention.

Flood and Bush Fire Relief Measures

The Chief, Regional Extension Services, is a member of the New South Wales Flood and Bush Fire Relief Committee. One of the duties of Regional extension officers was to investigate claims for flood or bush fire relief submitted by tenant and share farmers.

Three floods occurred on the Lachlan River in the Mid-western Region, and two floods on the Murrumbidgee River in the South-western Region. Regional staff investigated the resultant claims for relief, and the reports were submitted for attention by the State Committee.

Regional Matters of Special Note

South Coast and Tablelands Region

Yass River Valley, Research and Extension Study.—This research and extension study on the Southern Tablelands has been a joint undertaking by the C.S.I.R.O. and the Department of Agriculture. It aimed to assess the current agricultural situation in the pilot area, and to determine the problems in the way of reaching the potential production as defined by current knowledge. It was commenced in 1957. Drafting of the final reports of the study has been delayed by shortage of suitable staff.

Three landholders have been appointed to the Joint Planning Committee, as part of a programme aiming to encourage landholder organisations to implement the findings of the Committee.

Lamb Mortality Survey.—Regional staff co-operated with the district veterinary officer in collecting 500 lamb carcases, for a study of the causes of high lamb mortality.

Serrated Tussock Publication.—Regional staff assisted the Central and Southern Tablelands Serrated Tussock Committee, by compiling a leaflet on tussock control printed locally for the committtee. Ten thousand copies were printed and distributed amongst landholders in tussock areas.

South Western Region

Eradication of Fruit Fly.—A "Mobile Fruit Fly Eradication Unit", comprising a field assistant and a utility truck provided by the Department and two misting machines provided by the fruit industry, was established. This was to eradicate and prevent re-establishment of fruit fly in the Murrumbidgee Irrigation Areas. Systematic spraying of

Griffith, Leeton, Narrandera and Hillston proceeded. The South Western Region was free of fruit fly at the end of the season, with the exception of Hillston. Further spraying in the coming season should complete the task.

Application of Gypsum in Irrigation Waters.—To extend the results of C.S.I.R.O. research, an agronomist was located at Deniliquin to demonstrate the method and the advantages of applying gypsum in irrigation waters for pasture establishment on the heavy soils of the south-western irrigation districts.

Coleambally Irrigation Area.—The Griffith District agronomist continued close liaison with the establishment and development of farms in the new Coleambally Irrigation Area. It necessitated personal attention to settlers. Because of this it was necessary to appoint an agronomist assistant at Griffith.

Bi-Lingual Vegetable Growing Guide.—The Region produced this in English and Italian for distribution to the many vegetable growers in the M.I.A. Most of them are Italians. Officers also produced an M.I.A. Orchard spray calendar for distribution.

MID-WESTERN REGION

Regional Spray Guide.—Officers compiled a Regional Spray Guide and arranged for farmers' co-operative societies at Young to print 400 copies, at a cost of £65.

WESTERN REGION

Aerial Top-dressing and Sowing.—Officers have been closely associated with the rapid extension of the use of aircraft in agriculture in the Western Region. Some 835,000 acres were topdressed with superphosphate from the air, compared with 500,000 acres in 1959-60. About 8,000 acres were sown with subterranean clover seed by aircraft, most of it was land infested by serrated tussock.

MID-COAST AND HUNTER REGION

New Agronomist District, Muswellbrook.—Following subdivision of the Maitland agronomist district into Upper and Lower Hunter districts, a District agronomist has been appointed with Muswellbrook as headquarters. There is now a much better service to landholders in the Hunter Valley.

Hunter Valley Research Foundation.—Regional staff, particularly the agronomist, extension and research, have worked closely with the Hunter Valley Research Foundation.

Expanded Irrigation.—The Department's extension services may claim an appreciable share of the credit for the fact that 95 per cent. of dairies in the Upper Hunter district now employ supplementary irrigation. There are 840 irrigation plants. They provide supplementary irrigation on 25,000 acres, as against 400 plants, watering 9,000 acres, in 1956.

NORTH COAST REGION

Beef Cattle Extension Service.—Beef cattle in the North Coast Region has rapidly increased in importance. A Livestock Officer (Beef Cattle) has now been appointed to Lismore. The appointment has further stimulated interest in beef cattle production.

Research-Extension Liaison.—Very much closer liaison between research and extension officers has accrued from the appointment of a Supervisor of Dairy Industry Research for the North Coast. The degree of research-extension liaison essential to this area with its unusual range of problems has been helped also by the Regional Supervisor being appointed a member of the North Coast Research Council, and appointment of the Regional publicity officer as the Research Council's Secretary-Treasurer.

NORTHERN REGION

Expanded Tobacco Production.—Tobacco acreage increased by 30 per cent., and there was a near record yield of half a ton per acre in the Inverell area.

NORTH-WESTERN REGION

Premium Wheat Handled in Bulk.—Regional officers and the North-Western Agricultural Advisory Committee played an important part in the introduction of the bulk handling of 2,500,000 bushels of premium wheat produced in the Region.

Beef Cattle Extension Service.—Following the appointment of a Livestock Officer (Beef Cattle) at Gunnedah, there has been marked stimulation of interest in beef cattle production in this Region. One of the extension service effects was a very successful short-term Beef Cattle School.

AGRICULTURAL EXTENSION GRANT

The Commonwealth Extension Services Grant was first made to the States in 1952. The Commonwealth Government has determined that the grant will continue until 30th June, 1965. The annual allocation to this State is £75,000.

Agricultural Extension Grant Projects

Range.—Broadly, the projects comprise:—demonstrations concerned with crops, pastures, livestock, horticulture, and equipment, on farmers' properties; provision of extension aids equipment, such as cameras, slide projectors, tape recorders, film projectors, and public address systems, to extension officers; appointment of staff to provide assistance to professional officers in the field; staff to assist production of publications, and preparation of material for press and radio; payment of fees and expenses for Agricultural trainees and cadets at universities and colleges; and visits by officers to other States and overseas for attendance at conferences or to gain knowledge which will benefit them in their extension duties.

Since 1952, ninety-one different projects have been financed with Agricultural Extension Grant funds. There are forty-three current projects. Recent additions have included: (*a*) purchase of ten Water Testing Units for location in country districts; (*b*) overseas study by the Chief, Regional Extension Services, in attending the 9th International Training Centre on Methods and Programme Planning in Agriculture and Home Economics Extension organised by the International Agricultural Study Centre, The Netherlands; (*c*) part of the cost of the exhibit to be staged at the World Poultry Congress in Sydney, 1962; and (*d*) costs incurred by the Principal Agronomist (Pastures) for attendance at the 8th International Grasslands Congress and for pasture investigations in South Africa and the United States of America.

Pastures Projects.—In the vicinity of 1,500 pasture demonstrations, area ranging from 5 to 50 acres, have been conducted on farmers' properties. These have demonstrated recommended pasture mixtures, sowing methods, pasture management, and fodder conservation. They have been of distinct extension value as sites for field days conducted by extension officers. At 30th June, 1961, there were thirty-three pasture projects.

Land Planes for Irrigation Preparations.—An Ashton type land plane, an automatic land leveller manufactured at Leeton, New South Wales, was purchased to demonstrate methods of preparing land for irrigation. Many demonstrations have been performed in the Wakool Irrigation District, the Jerilderie District, and the Deniliquin District. These have extended for the period from 1955.

As a result, many implements of this and similar types have been purchased by irrigation farmers. The project has had a great influence in raising the standard of irrigation farming throughout these irrigation districts.

Beef Cattle—Improvement of Breeding Stock.—Demonstrations of the selection of beef breeding cattle, using grade and rate of gain as the yardsticks, were commenced at Bombala in 1956. Other demonstrations have been started at Newbridge, Canowindra and Woodstock. Portable cattle weighing scales were purchased to measure the rate of gain of cattle in these demonstrations.

The results have shown the great value of selecting cows of beef breeds on the basis of their ability to produce calves of good type and high rate of gain. These demonstrations have captured a lot of interest amongst beef producers.

Field days have been conducted on the properties where the demonstrations are, to extend the information; and one co-operating breeder at Bombala has had a bulletin published. It sets out complete details of the selection methods used.

Mobile Mechanisation "School" Project.—A 35 cwt. truck, with body fitted to store, display and work to greater advantage the demonstration equipment, is located together with the demonstrator, in the North and North Western Regions.

A further increase in farm mechanisation in these areas has shown this project to be a valued extension medium amongst the farming community. Eighty-one farm visits were made by the unit this year, and demonstrations and advice on maintenance and operation of farm machinery were freely given to farmers. Twenty-eight field days were held. Attendances ranged from ten on minor occasions to several hundred at bigger field days.

Regional Agricultural Machinery Advisers.—A decision to appoint two new Machinery Officers has been made. They will be located respectively at Leeton and Orange, to provide in the Western and South Western Regions an advisory service on all matters pertaining to the use of agricultural machinery.

Italian Language Project.—The Italian-speaking liaison officer in South Western Region, first appointment in 1954, has facilitated conveyance of extension officers, technical advice to the Italian communities of the Murrumbidgee Irrigation Areas. Perspective on the appointment is more readily gained when it is appreciated that 8,000 of the 30,000 population in the M.I.A. are Italians who have settled there in the past 15 years. Some 98 per cent. of vegetable growers are Italians or New Australians who were unable to speak English when the liaison officer was first appointed.

Forty field demonstrations carried out on Italian-owned properties would have been almost useless without the presence of this officer.

Translations of the *M.I.A. Vegetable Growing Guide* were completed and made available to farmers during the year, and translations of Regulations concerning fruit-packing and matters relating to diseases of tobacco and rice were also translated.

Decentralised Water and Soil Testing Units.—Ten water and soil testing units located in country districts for testing water and soil salinity have proven themselves as extension aids. The units were installed at Regional headquarters (Tamworth, Gunnedah, Lismore, Orange, Cowra, Goulburn, East Maitland, Wagga, Leeton) and at Barham. Formerly, all soil and water testing was carried out at the laboratory of the Chemistry Branch, Division of Science Services, Sydney.

The decentralised units have this year been used for quick on-the-spot testing of 1,326 water samples, and ready advice on their suitability or otherwise for proposed uses. More than 200 soil samples were also tested. The service has saved some landholders from incurring damage or loss.

Extension Aids Equipment Project.—The wide range of equipment to assist field officers' extension work was increased by provision of additional or replacement 16-mm. cine projectors, improved tape recorders, and more 16-mm. cine films. Seventy-three country offices are equipped with essential extension aids. The more valuable of these have been the cameras, slide and film projectors, and tape recorders.

Camera work by extension officers this year produced 9,040 coloured slides and 6,270 black and white slides for use in extension, 521 programmes of 16-mm. cine films were collated and loaned by the Division of Information Services for use by country officers in extension, and more were borrowed by field officers direct from other agencies; and the tape recorders have been key equipment in the success of regular farm broadcasts over thirty-eight rural radio stations.

Field Assistance Project.—Twenty field assistants are employed under the Agricultural Extension Grant. Each is supplied with a panel van or a utility truck. Eleven of the utilities provided from Grant funds have been replaced by panel vans.

The field assistants render valuable help to professional Advisory officers, thus increasing the efficiency, quality and volume of professional services rendered to the farming community. The important contributions made by the field assistants are illustrated by the following examples supplied by a Regional Supervisor—typical of all.

In the Western Region, where there are three field assistants, each with a vehicle, major relief was gained by District agronomists and other officers, in the establishment, maintenance and harvesting of field demonstrations and trials. At Bathurst, thirty-one demonstrations, four Uniform Pasture Survey Extension Trials, and four other trials were established and maintained. At Orange, forty-seven farmers' experiment plots and trials were established and maintained because of the field assistants' help. He also assisted in the conduct of twenty-five field days; in seed certification (thirty days); and in orchard trials and other allied work (twenty-four days). In Dubbo and Mudgee districts, the field assistant's valuable assistance to the respective District agronomist made possible the establishment of 184 demonstrations and trials.

Publicity Officer Project.—This project, initiated in 1953, has provided a Publicity Officer in each of the nine Agricultural Regions. They assist field officers in preparing and processing material for press and radio usage; organise opportunities and channels for use of mass and group media; assist rural groups in their organisation of and publicity for activities, and develop the interest and skills of extension officers in the use of extension equipment in their agricultural advisory work.

A measure of the important part they have played in Regional extension work is provided by the 2,250 publicity statements issued by field staff with the help of the publicity officers, in the past year, and by the 500 hours of radio stations' time used by the Regions.

Agricultural Trainees and Cadets Project.—£8,000 was allocated from the Agricultural Extension Grant (and £4,000 from the Dairy Industry Extension Grant) to pay the fees and expenses of Agricultural trainees at universities and cadets at agricultural colleges. This year twenty-seven such students were in training, either at Sydney University, New England University, Hawkesbury Agricultural College, or Wagga Agricultural College.

Book and Pamphlets Projects.—Mr. J. N. Whittet, former Principal Agronomist (Pastures) who was appointed Editorial Assistant (Author) in the Division of Information Services to produce the "Weeds" and "Pastures" books, ceased duty in this capacity on 16th June, 1961. The manuscript (750 pages) for the second book, "Pastures", had been completed. Other work for this publication will be done by Mr. Whittet on a contract basis.

The "Weeds" book was made available for sale in December, 1959. The first edition, 5,000 copies, has sold well. This year's sales of 1,260 copies made the total 3,960 copies. Revenue (£6,777) is paid into a special fund to reimburse the Agricultural Extension Grant fund from which the production was financed.

Additional, district pasture booklets were issued during the year bringing the total now on issue to twenty-eight. Additional, insect pest leaflets, in natural colour, were completed, and twenty-two are now in distribution. Art work for another fifteen has been completed and they are at the printery.

Library Facilities Project.—Initiated in 1953, this project has aimed to improve library services for country officers affecting extension services. Select collections of text books have been distributed to country officers and a central library photo-copying service has been set up. One officer is employed on the latter, and in cine film checking/repairs, with salary from the Agricultural Extension grant.

Seventy-three country officers now have select collections of books; 150 supplied this year brought the book total to 1,483.

Dairy Industry Extension Grant

The Commonwealth Dairy Industry Extension Grant, first made in 1948, will continue to 1963. The allocation to New South Wales is £64,880 per annum. The Grant is used to improve practices in the dairying industry by allocation of funds to projects of an extension nature.

Range of Projects.—The projects include—demonstrations on pastures and fodder conservation; surveys into milking machine efficiency; surveys into sterility in dairy cattle; recording of production of dairy cows for herd improvement; field assistance in dairy advisory work; supply of extension aids; and appointment of trainees and cadets to Universities and Agricultural colleges.

Responsibility for supervision of farm demonstrations of an agronomic nature under this Grant has been transferred to the Division of Plant Industry. District dairy officers continue to control demonstrations of the more technological type peculiar to the dairying industry, e.g., "Solids-Not-Fat-in-Milk", "Water Cooling Towers for Cream Cooling", and "Self-Feeding Rack" demonstrations.

Grade Herd Recording Project.—This has been included in the report of the Division of Dairying.

Milking Machine Efficiency Survey Project.—This has been included in the report of the Division of Dairying, and of Hawkesbury Agricultural College.

Sire Survey Project.—Publication of Sire Survey results in "Dairy Topics" (bi-monthly journal to dairy farmers) continued, and further figures are being correlated for publication.

Infertility Survey in Dairy Herds.—Two papers have been submitted for publication. These are "Herd Infertility in Dairy Cattle on the South Coast of New South Wales" and "Differential Diagnosis of the Causes of Herd Infertility in Dairy Cattle".

"Solids-not-Fat" Recording Units.—Two units were formed during the year, one under the supervision of the Nowra District dairy officer, and the other under the control of the Parramatta District dairy officer. In these two units, 28 herds, averaging about 40 cows, and covering all dairy breeds, are being recorded. In conjunction, the five Departmental Stud Herds (Wagga, Richmond, Grafton, Yanco and Bathurst) are being recorded. This makes it the largest "Solids-not-Fat" testing scheme so far introduced in New South Wales.

Water Cooling Towers for Cream Cooling.—District dairy officers have established twelve demonstrations.

Self-feeding Racks.—District dairy officers have established four demonstrations.

Bloat Control.—One demonstration has been set up. The project has extended the spraying of crops and pastures with ready-mixed parathon-based emulsions, to prevent bloat. Fifty farmers in the Maitland district used the spray during the spring of 1960.

Pasture and Fodder Crop Demonstrations.—Sixty-one new demonstrations were arranged by the Division of Plant Industry, concerned with improved pastures, lucerne growing, winter fodder crops, silage making, and use of nitrogenous fertilisers on maize. There were sixty-four such demonstrations at 30th June, 1961.

Bi-monthly Booklet "Dairy Topics".—Six issues were produced and mailed direct to dairy farmers. The number of copies printed now is 18,500, an increase of 400 compared with twelve months ago.

Cine Film "T.B. in Dairy Cattle".—This 16-mm. film was completed and approved for use in extension service.

Staff.—One Senior Organising Officer and six field assistants are employed under the Dairy Industry Extension Grant. The Senior Officer is located in Sydney and the field assistants are located respectively at Murwillumbah, Lismore, Coff's Harbour, Kempsey-Taree, Kiama and Bega. These officers gave valuable assistance to professional extension officers in arranging and conducting the programme of demonstration projects provided by the Grant.

Agricultural Trainees and Cadets.—£4,000 is allocated annually from the Dairy Industry Extension Grant for payment of fees and expenses of Agricultural trainees at universities and cadets at agricultural colleges.

Seven trainees and cadets completed their training at the end of 1960 and are now employed in the Department of Agriculture as agronomists (2), veterinary officers (3), and livestock officers (2). A Departmental cadet trained under this scheme was dux in the 1960 annual examinations for the Wagga Diploma of Agriculture.

Eighteen trainees were at the University of Sydney this year, two were at the University of New England, and seven cadets were at the Agricultural Colleges—Hawkesbury and Wagga.

HAWKESBURY AGRICULTURAL COLLEGE

Proposed Course Amendments.—Recommendations for major amendments in the character of training courses at this College, and at Wagga, were formulated in 1960 by a select Agricultural Education Committee established by the Public Service Board. The recommendations are under the attention of the Minister of Agriculture, and Parliament.

Earlier in this Report of the Department of Agriculture, under "Notes from Central Administration", is a summary of the recommendations. (See page 18.)

Student Enrolment.—In 1961, the student enrolment total has been 243, six more than in each of the two previous years. Since there are only 231 student rooms, some First Year Students are sharing rooms.

Of the total, 192 are in the Agriculture course, 31 in Dairy Technology, and 19 in Food Technology. The total in Agriculture (192) is two more than last year, and a record.

Heavy admissions were made into the first year of each Diploma course, to satisfy as many applicants as possible. The admission of 20 into First Year Dairy Technology, 13 into First Year Food Technology and 77 to Agriculture comprised a record number for each.

Despite the effort to accept maximum numbers, the waiting list for the Agriculture course extends three to four years ahead.

Sources of Students and Places of Employment of Diplomates.—Of 192 students enrolled in Agriculture, 66 are sons of farmers. The percentage is low, in terms of potential farmer students, if weighed against the original College objective—to train young men for the land.

Of the 58 diplomates for 1960, 25 have gone to farming or grazing properties, six have entered the State Department of Agriculture and 13 have entered other governmental agencies; private firms have accepted 12 (nine as technical representatives and three in other capacities); one is undertaking a University course and one has gone overseas for further studies.

Those in governmental agencies are preparing for extension or allied work that will help the promotion of better agriculture. Of those in private firms, some are using their College training and others using it in part. Overall, work to which diplomates proceed may be regarded with satisfaction, for the effect upon agricultural industry.

The national impact of the training in the Dairy and the Food Technology Courses has again been emphasised by the admissions from other States and the employment of many diplomates in other parts of the Commonwealth.

Admissions to the Dairy Technology Course this year, included two from Western Australia, one each from South Australia and Victoria, and one Colombo Plan student from Ceylon.

Distribution of the 333 Diplomates from this course since 1928 has been as follows: New South Wales 240, Victoria 42, South Australia 15, Tasmania 12, Queensland 12, Western Australia 6, Australian Capital Territory 2, outside Australia 4.

The first diplomates of the Food Technology Course were in 1952. The 54 diplomates up to 1950, are now distributed as follows: New South Wales 29, Victoria 16, South Australia 3, Tasmania 3, Queensland 1, outside Australia 2.

Education Standard of Entrants.—The minimum standard for entrance to all courses is at present the Intermediate Certificate. The trend of recent years towards a standard higher than Intermediate Certificate has continued.

This year the percentage of entrants of Intermediate Certificate standard only, into Agriculture, was 20 per cent. as against 26 per cent. last year; into Dairy Technology, 35 per cent., as against 57 per cent. last year; and into Food Technology, nil, as against 14 per cent. last year.

Educational Standard of Students Upon Entry—Two years' Comparison

Individual Qualification	Agriculture per cent		Dairy Tech. per cent		Food Tech. per cent	
	1960	1961	1960	1961	1960	1961
Leaving Certificate Pass	40	49	27	40	75	77
Leaving Certificate Fail	12	17	..	15	12	23
4th Year Secondary School	19	14	13	10	nil.	nil.
Intermediate Certificate	29	20	60	35	13	nil.
Total	100	100	100	100	100	100

Admission of Colombo Plan Students.—One student is now admitted to the Dairy Technology Course each year. The first, from Ceylon, was admitted in 1960.

Report Writing for Students.—Last year a new subject—"Technical Reports" was introduced for final-year students in all three courses. Students were required to present a thesis on a subject self-chosen. This was to give students reason to study in a specialised field, to gain experience in orderly recording of observations, facts and impressions, and in abstracting and condensing matter from reference books.

The results have been pleasing. Some of the theses submitted were of a high order.

Woolclassing Qualifications.—College students again maintained a high standard in the Final Certificate examinations in Woolclassing conducted by Sydney Technical College. Of 17 who took Stage II of the Sheep and Wool examination, 16 received a Distinction and one a Credit mark.

Diplomas Examination Results.—Diplomas awarded in 1960 were as follows: Diploma in Agriculture, 58; Diploma in Dairy Technology, 17; and Diploma in Food Technology, 7; total 82.

Honours awarded in Agriculture for 1960 included one Class I, and five Class II; in Dairy Technology, two Class I and one Class II; and in Food Technology, one Class II Honours.

Students' Tours and Visits.—The regular instruction tours and visits to places of interest were conducted.

Student Extra-curricular Activities.—The extra-curricular activities were well conducted. The Students' Representative Council, the Sports' Club, the Debating Society, the Camera Club, the Student Christian Movement and the College branch of the Agricultural Bureau, all contributed to the promotion of social life and welfare of the College. The Inter-Year Debating Shield was won by Agriculture III.

The Olympic Pool was officially opened on 10th December by the Minister for Agriculture. Some 1,200 people attended. During the afternoon £120 was raised and forwarded to the Principal of Wagga Agricultural College, to help the Wagga pool fund.

The pool has been made available one afternoon per week to three local groups of school children—High School, Primary School and Catholic School.

Short-term Schools.—A comprehensive range of short-term schools (9) was held at the College, all but one of them in the winter vacation. They were for dairy farmers (50 attended), pig raisers (35), poultry farmers (45), tractor maintenance learners (97), potential rural leaders (22), Junior Farmer Club members (19), food factory apprentices (44), beekeepers (18), dairy factory apprentices (35), and others—concerned with milking machine efficiency, etc.

Sectional Operations at Hawkesbury

The various farm sections continued their normal work of production, instruction, demonstrations and research.

COLLEGE FARM

Autumn Cropping—Cereal Production.—A total of 400 acres was seeded to cereals, including 100 acres solely utilised for grazing. Crops were not heavy but a better than average harvest was produced.

From the 300 acres (non-grazing) of wheat, oats and barley came 300 tons of green material for silage, 100 tons of baled oaten hay, 200 tons of sheaf hay mainly oaten, and 200 bags of barley grain. The barley grain crop ran 10 bags per acre, and the baled oaten hay was short strawed and excellent.

This season 400 acres have been seeded to cereals.

Cereal Fodder Reserve.—About 135 tons of cereal hay was utilised for stock feed, mainly for the Arab stud. A further 18 months' supply is on hand.

Summer Crops.—Over the year, 14½ tons of lucerne hay were transferred from other State farms and used at the College Dairy Section. The total of lucerne hay harvested from College areas was 83 tons. About 30 tons were on hand at the 30th June, 1961.

Poultry Feed.—Berseem Clover (2 acres) was grown for production of a legume dust for poultry feed, and the milling was six tons. Four tons of lucerne dust were made. Thus 10 tons of legume dust was delivered to the Poultry Section.

Oaten Grain.—A total of 106 tons of oats was received, 58½ tons by purchase and 47½ tons by transfer from other institutions. At the end of June, 24 tons were still in store.

Wheat Grain.—Wheat transfer from other Farms decreased; 30 tons received and utilised at the Poultry and Piggery Sections, compared with 43 tons in the previous year.

Silage Production.—Some 500 tons of green forage were cut for silage; comprising 100 tons of maize, 100 tons of saccaline and 300 tons of barley and oats. At the end of June, 200 tons of silage were on hand. Annual consumption of silage is approximately 400 tons. The 100 tons of stack silage mentioned in last year's Report were successfully used for winter feeding of beef cattle.

River Farm.—Early maize and sorghum crops were good; 200 tons of green fodder harvested . The maize grain crop was only fair; from the 10 acres sown, 600 bushels of grain.

Potatoes.—Three crops of potatoes were grown; 12 tons were harvested.

Lucerne.—Lucerne hay production at the River Farm remains unsatisfactory, stands failing to persist with reasonable productivity after eighteen months; production, over twelve months, was 50 tons from 20 acres—with a high percentage of summer grasses in all hay produced. Poultry manure top dressed on the least productive areas has built up the soil fertility. The operation is only limited by manure availability.

Pastures.—In 65 acres sown in autumn, 1960, sub. clover, rye grass and white clover have established satisfactorily. This area, and the 250 acres previously established, gave useful feed throughout the growing period and, in January, 2,200 bales of pasture hay (about 50 tons) were cut.

Richmond Irrigation Area.—This area contributes a lot of feed to the Dairy Cattle Section. A plan designed by the Water Conservation and Irrigation Commission to regulate use of water from the turkey nest and hillside dams will overcome a problem that will help stabilise production from this irrigated area.

Blacktown Irrigation Area.—The turkey nest dam was filled throughout the year, and the 40 acres of pasture irrigated from it were a major factor in supplementary feeding of beef cattle and production of lambs.

In the overall irrigation plan, 22 acres of this area, comprising summer pastures, in conjunction with 44 acres of the Richmond dairy paddocks will be irrigated from 29 million gallons of water stored in the hillside and turkey nest dams.

Stock Water Supply.—Four dams of 500 cubic yards capacity were constructed, to allow better stock management and utilisation of feed.

Clearing Operations.—Thirty more acres have been cleared, and sown with a "cleaning" cereal crop this autumn, to be part of 112 acres to be irrigated from the Richmond sewerage effluent. In various Londonderry paddocks another 100 acres have been cleared and windrowed to increase the arable area available for crops and pastures. Clearing of light scrub from a further 28 acres has been completed to enable better grass growth.

Horses.—The Arab stud was reduced by sale and transfer of five head, while one sire was received and eight foals were born. The present Arab total is 38 head. The draught horses were reduced from 22 to 11 and coach horses and hacks from 13 to 12. Total of horses at the 30th June was 61 head, eight less than a year ago.

Fencing.—New fencing completed: 170 chains; repair and netting of boundary fences: 120 chains.

Tractors and Machinery.—A crawler tractor was replaced; two tractors were replaced "on loan", and one more tractor was purchased by the Department. Machinery purchased included a disc cultivator and a direct drop fertiliser distributor

ORCHARD SECTION

Crops.—The citrus crop was light, and hail-marked. The stone fruit trees set well but were mostly stripped of fruit by hail. Similarly the light crop of pears was of little value because of hail; and most varieties of grapes yielded only lightly.

Strawberry Variety Trials.—A further small plot of Richmond Red Strawberry was planted. A small area of the Department's selection Kendall, and plants of the variety Majestic, have also been included in these plots this year.

Persimmon Variety Trials.—It was not possible to collect and record observations on blossoming, pollination and fruitfulness of Persimmon varieties this year. However, seeds have been recorded for identification purposes. Seedlings will be raised for use in propagating.

Washington Navel Rootstock Trial.—Details of maturity and size of oranges from trees on the various root-stocks were obtained. Data on percentage juice, acidity and total solids were recorded. The range of sizes from each stock was also recorded.

Orchard Development and Reconstruction.—Plantings of stone fruit trees and vines were commenced according to plan.

The apricot and peach trees have made good growth. The grape vine area to be developed was planted with 106.8 *Phylloxera*-resistant stocks. These were budded to table grape varieties and appear to be well calloused.

Some Valencia trees were planted where progressive plantings will be made each year.

A section of later clingstone varieties of peaches was removed. These trees were in decline and the varieties were unsuitable.

Old Valencia trees treated to demonstrate renovation by "Skeleton pruning" have made excellent growth and should carry a good crop next season.

New areas have been prepared for fruit tree nursery purposes. All main fruits are being propagated, to provide for student instruction, and to supply trees and vines for College orchard requirements.

Educational.—The policy of providing sufficient trees of all ages in the different kinds of fruits has enabled more comprehensive demonstrational work. The greater number of trees now available allows more student participation.

Additional units of modern cultivating equipment have been obtained, for more efficient cultural operations, and better student instruction.

Members of Wiseman's Ferry Branch of the Agricultural Bureau arranged a one-day visit to the College, and the day was spent discussing orchard activities—with particular attention to renovation of citrus trees.

College Extension Service.—Field extension work has been done by the Special Fruits Officer, Hawkesbury Agricultural College, since March, 1961. An initial visit to each locality in the district was made in company with the Fruit Inspector. Since then, visits have been made to growers in all parts of the district to perform the usual Departmental services in extension. Special work has been done on the development and maturity of mandarins through the extension service.

General.—Fresh fruit was supplied for College domestic requirements, and certain kinds of fruit were used by the College Cannery.

College Sheep and Wool Section

Management.—Much greater use was made of irrigated pasture. Strip grazing, using a two-wire electric fence, enabled high stock concentration on a small area—for maximum utilisation of feed available.

Water Supply.—A number of additional ground tanks to supply stock water requirements were constructed in various paddocks previously not available for stock during summer because of lack of water. More remains to be done in this respect.

Fencing.—Fencing on the College remains the biggest problem in the efficient management of sheep and utilisation of pasture.

Fertility-testing of Rams Before Use.—This has now been introduced to prevent poor results due to low fertility rams.

Production Per Acre Experiment.—This trial, begun in July, 1960, in co-operation with the Agronomy Section, comprises results of stocking rates from 10 through 8, 6 and 4 ewes per acre against a control of one per acre on native pasture.

Storage of Ram Semen.—A large-scale trial has been established in co-operation with the University of New South Wales to determine the fertilizing power of ram semen after twenty-four hours of storage.

Synchronisation of Oestrous with Progesnone and P.M.S.—This possibility is under test in another trial established in collaboration with the University of New South Wales. For this trial 500 merino sheep, the property of the University, were agisted to the College for four months.

Dorset Horn v. Cheviot as Fat Lamb Sires.—This comparative trial has commenced. It will also include various castration treatments of lambs to determine the effect of castration in lamb growth rate.

Hormone Implants for Lamb Growth.—A trial in conjunction with an American firm has commenced. It is to determine the effect, on lamb growth rates, of implants of five different hormone formulations.

Flock Statistics.—At 30th June, 1961, the College flocks totalled 950 head; comprising 80 in the Romney Marsh stud (ewes and rams), 531 commercial flock ewes, 105 commercial flock rams and 234 ration sheep.

The 1960-61 shearing yielded 30 bales, weighing 9,132 lb.

Per cent. Lambs Marked.—From 60 Romney Marsh ewes mated, the lambs marked percentage was 55.5; in the Experimental Flock from 90 ewes mated the percentage was 125, and in the Commercial Flock from 300 ewes mated the percentage was 87. Overall, from 450 ewes mated the lambs marked percentage was 90.

Dairy Cattle Section

Friesians Exhibited at Shows.—A team of 19 Friesian cattle was exhibited at the 1961 Sydney Royal Show. It gained 24 awards. These included Senior Champion ("Hawkesbury Prince Regent"); Junior Champion ("Hawkesbury Fond Rosemaid"); 11 Firsts, four Seconds, and five Thirds. The College was the most successful exhibitor in the Friesian Section. More awards were gained at the Hawkesbury District Show, including "Most Successful Exhibitor (Dairy Cattle)".

Friesian Stud Statistics.—There were 149 head in the stud at 30th June, 1961, comprising five adult bulls, five "loan" bulls, 53 cows, 29 hiefers, and 57 calves under one year.

Friesian Stud Sales.—Thirteen bulls (£1,175) and 17 females (£1,444) were sold. Demand for all Friesian stock continued high, and there is a large waiting list for males and females.

Friesian Breeding Programme.—An analysis shows that, excluding purchased sows, the females have been sired by no less than 19 bulls.

Production by the daughters of the imported bull, "Sniders Fond Hope King", has slightly improved upon that of his Canadian progeny. In Canada, the first nine daughters to record produced an average of 8,878 lb. milk, and 344 lb. butterfat, at a 3.9 per cent. test. His first seven Australian daughters have averaged 10,170 lb. milk, 380 lb. butterfat, at a 3.8 per cent. test. (The sixteen two-year-old daughters thus averaged at 9,393 lb. milk, and 353 lb. butterfat.)

Herd Averages.—During the last recording period, 33 cows in the Friesian herd averaged 12,832 lb. of milk, 448 lb. of butterfat, at 3.5 test average. This was an increase on the previous year's figures, 11,440 lb. milk and 409 lb. butterfat.

Milk and Butterfat Production 1960-61.—A large proportion of the older cattle in the herd produced over 500 lb. butterfat over a 300 day period. The following figures are for the last official recording year:—

2 year olds—12 averaged 11,690 lb. milk and 368 lb. butterfat.

3 year olds—8 averaged 11,122 lb. milk and 402 lb. butterfat.

4-9 year olds—7 averaged 13,647 lb. milk and 416 lb. butterfat.

9 years and six months and over—6 averaged 12,810 lb. milk and 485 lb. butterfat.

Beef Cattle Section

Poll Hereford Stud.—This stud now comprises 64 head; 33 adult females, 15 hiefers, 3 bulls in use, and 13 young bulls.

"Pylara Taurus", who has been used since the stud was founded in 1956, is on loan to the N.S.W. Milk Board, and located at Berry Artificial Stock Breeding Centre. A young bull, "Pylara Jock", purchased from Pylara stud for 800 gns., has been used to some extent. Two of his hiefer calves are now being reared.

A young bull, "Hawkesbury Taurus 10th", was sold for 200 gns.

Commercial Herd.—Recently 43 head of horned Hereford weaner hiefers were purchased from Gloucester. These are the nucleus of a commercial herd of beef cattle, being formed at the College.

Poultry Section

Breeding.—Poultry and turkey breeding operations were carried out.

The sire-family method of selection of breeding stock, begun in 1956, is yielding continued improvement in the College flock.

Egg Laying Competition.—The 59th Egg Laying Competition concluded on 23rd March, 1961. A full report has since been published.

In the 60th Competition which began on 1st April, 1961, Divisions II and III were deleted.

The selected Divisions respectively comprised six birds on deep litter and six birds in single bird stepped-tier California cages. Declining support of egg laying competitions in favour of Random Sample Testing prompted the decision.

Random Sample Laying Tests.—The 8th Random Sample Laying Test concluded in December, 1960; 500 days from the actual hatching date of each sample. A full report has been published. The 9th Random Sample Laying Test began in August, 1960.

To meet an increased demand for Random Sample Testing, there is now accommodation for 26 entries. Each entry now comprises two replications, of 40 birds on deep litter and 20 birds in laying cages. Formerly each entry was one group of 40 birds on deep litter.

Random Sample Meat-type Test.—The 1st Random Sample Meat Test for meat-type birds began on 19th January, 1961. Fertile eggs of special meat type birds were collected from nine entrants and hatched at the College. Eighty cockerels and 80 pullets from each group were reared to 12 weeks. A full report has been published.

Accredited Breeders Random Sample Test.—The 3rd Accredited Breeders Random Sample Test which began in August, 1959, concluded in December, 1960. This Test has now been discontinued in favour of open Random Sample Testing. A full report of the 3rd Test was circulated to all breeders and the poultry press.

Annual Poultry Farmers' Field Day.—The Annual Poultry Farmers' Field Day was held in May, with a record attendance of 1,500. On this occasion 35 trade exhibitors affecting poultry industry provided displays.

Modern Poultry Processing Plant Installed.—This new installation is providing first class hygienic conditions for the slaughtering, for College use and student instruction.

New Rearing Sheds.—Two large intensive rearing sheds have been constructed, to accommodate chickens from brooding to laying period. They replaced the out-dated colony range system, and will be great assets for future Random Sample Meat Tests.

PIGGERY SECTION

Outbreak of Rhinitis.—This occurrence in mid-1960 led to some months of quarantine.

The health and quality of the stock has been maintained at the usual standard.

Landrace Purchases.—Two in-pig gilts, two young gilts, and a young boar, of the Landrace breed, were purchased at Arcadia.

Present Breeding Stock.—This comprises seven Tamworths (a boar and six sows), nine Berkshires (two boars and seven sows), 16 Large Whites (three boars and 13 sows), and five Landrace (a boar and four sows).

Sales.—The quarantine period curtailed sale opportunities. Three stud sales were made, realising £94; 63 market sales brought £632.

Building for Teaching Purposes.—A demonstration shed has been erected, to be fitted with demonstration pens and the necessary teaching aids—for demonstrations in all weathers.

Demonstrations and Experiments.—Digestibility trials using various winter legume mixtures were conducted. Varied methods of early weaning; farrowing accommodation; and sow management during gestation, were demonstrated.

APIARY SECTION

Season Outstanding.—It was the best season for bees in the Hawkesbury district since the record 1943-44 year.

The number of productive hives was increased to 90 and additional hive material was brought into use. The crop was 11,060 lb. of extracted honey, and sufficient was left on the colonies to provide winter stores and food for early spring brood rearing.

Hybrid Bees Programme.—Thirty small nucleus hives ("baby nuclei") were constructed and stocked with bees, to get hybrid queens with hybrid drones from two-way hybrid parent stock at the River Farm mating station. The offspring are termed four-way hybrid bees.

Productive colonies containing this type of bee are now being compared with other existing strains. The baby nuclei are too small to overwinter, and are united on to other colonies at the end of the season.

Queen Bees to Apiarists.—Queen bees supplied to apiarists totalled 136. Most of these were bred from a New Zealand Queen imported last year.

VETERINARY SECTION

Diseases Prevention.—To maintain the various herds and flocks on the Brucellosis, Tuberculosis and Pullorum free schemes, routine testing and vaccination continued.

Rhinitis.—An incidence of rhinitis in pigs was confirmed. Very little mortality occurred and the disease has now disappeared.

DAIRY TECHNOLOGY SECTION

The intake of milk and cream was sufficient for students to receive practical training comparable with that of previous years.

Factory Plant, Equipment and Operation.—The Dairy Technology building, now six years old, is structurally sound, but considerable expense must be incurred shortly in extensive flooring repairs.

Added Carton Products.—Cream mixture and ice cream mix have been added to the carton products. The ice cream mix has shown a ready consumer reception. This sale mix has enabled the School to double the practical training in ice cream processing.

Manufacture of sweetened condensed milk continued. Provision of a refractometer has helped to improve the quality.

Bottled and Bulk Milk Sales.—These have gradually risen and now average 800 gals./day. This level of production is not met by the dairymen vendors; additional milk is bought in from Nepean Dairy and Refrigerating Co.-op. Society Ltd.

Besides surplus milk from Hawkesbury Dairy & Ice Co-op. Society, and Windsor and Nepean Dairy & Refrigerating Society at Penrith, tankers of surplus milk were taken from United Dairies Ltd., Parramatta.

Cheese Production and Sales.—Except for about 2½ months, Government Stores Department was supplied with 4,000 lb. of cheese every fortnight for the year. Local sales have also shown an upward trend, especially in the 14-lb. size.

Student Instruction in Fancy Cheeses.—Edam, Blue Vein and Roman cheese were also made; sufficient for student instruction.

Dried Milk Production.—This dropped by 12½ per cent. The product is easily disposed of locally.

Butter Production.—Though cream supplies have declined over the years, sufficient cream is received for full student training.

Production Statistics.—Some 203,475 lb. of butter, 150,424 lb. of cheddar cheese, 1,219 lb. of fancy cheeses, 2,335 gallons of ice cream, 70,500 lb. of dried milk, and 113,280 cartons (¼ pint) of flavoured milk were produced, and 2,842,497 gallons of milk were pasteurised.

DAIRY RESEARCH

Staff.—Dr. S. Bakalor, Special Dairy Officer (Research), appointed in March for research projects financed by the Australian Dairy Produce Board is working on problems associated with Blue Vein cheese. Dr. B. Richards a bacteriologist of the Division of Science Services is actively associated with the project.

A Cheesemaker-Laboratory Assistant appointment is proposed. A Dairy Chemist has been appointed, located in the Dairy Technology School. He will also do country work using the College as headquarters. Dairy Research Officer Mr. G. J. Smith will return from the U.S.A. in August, 1961, to resume research at the College.

Milking Machine Research.—There is strong pressure on the Department to conduct research into detergent problems on behalf of the Standards of Performace of Milking Machine Components Committee. The aim would be a reliable comparative test of the performance of the many detergents now available to the industry throughout Australia. Progress has been made with the assistance of the Animal Husbandry Department of the University of Sydney in setting up the necessary testing facilities; but the actual project cannot be undertaken by the present establishment.

Processing of major Survey data has been helped by access to an analysing computer owned by Survey Research, North Sydney. The complete report will be available soon.

A fifth Survey Officer has been trained, as have other Departmental officers and private operators, in testing milking machines.

FOOD TECHNOLOGY SECTION

Winter School for Factory Foremen.—The third such school was conducted in conjunction with the Food Technology Association at the College. Forty representatives from industry attended, from every State in the Commonwealth; 26 firms, from diverse sections of the food processing industry, were represented.

Instructional Processing Operations.—The basic aim of the practical cannery operations is education, not production; to familiarise students with the technological principles in processing commonly marketed foodstuffs.

Over 70 different packs were processed by the Food Technology students this year. All vegetables processed were grown on the College.

Production Statistics.—Production of processed vegetables amounted to 16,500 lb. of consumer products; comprising in the main 10,000 lb. of canned vegetables, 5,000 lb. of quick frozen vegetables and 1,000 lb. of dehydrated vegetables. Fruit was obtained from the College and various departmental research stations.

Processed fruits and fruit products totalled 23,000 lb.; 13,000 lb. of canned fruits and 10,000 lb. of fruit pulps. A small amount of fruit was also dehydrated.

All College requirements of jam, more than 7,000 lb., were supplied. Most of the pulp was processed at the Cannery.

Vacuum packed quick-frozen poultry totalled 3,486 birds.

AGRONOMY RESEARCH SECTION

The research agronomists' work has been incorporated in the Division of Plant Industry section of this Report of the Department.

WAGGA AGRICULTURAL COLLEGE

Student Enrolment.—The College commenced its thirteenth year of curricular activity with a total of 96 students. The following table compares numerical distribution between the three Years in 1961 with those of the previous four years.

Students	1957	1958	1959	1960	1961
First Year	30	37	34	35	32
Second Year	28	32	31	31	34
Third Year	21	25	29	30	30
Total	79	94	94	96	96
Percentage of Assisted students	32·9	30·9	34·0	28·1	27·6

Thirty-six new enrolments included four admitted to Second Year. Of the 32 First Year students admitted, 21 had qualifications in excess of the minimum, including 16 with the Leaving Certificate. The proportion of admissions with only minimum qualifications (36.3 per cent.) compared unfavourably with 18.6 per cent. for 1960.

Diploma Examinations.—The 30 candidates in 1960 gained their Diplomas, one with Honours. The total of diplomates since 1951 is 220.

Statistics of Ex-student Occupations.—At 30th June, 1961, there were 302 ex-students (excluding any who were in the course for less than one session). Their occupations:—

(1) Following agriculture—		
(*a*) On farms		180
(*b*) In Government Departments, or quasi-governmental authorities—		
Agriculture	32	
Soil Conservation	9	
Education	6	
A.B.C.	2	
Rural Bank	1	
Valuer-General's	1	
Other	3	
		54
(*c*) In commercial firms		21
		255
(2) Undergoing further training		7
(3) Left agriculture		11
(4) Occupation unknown		26
(5) Deceased		3
		302

Thus, about 87 per cent. are following agriculture; assuming one-third of category No. 4 to be so doing.

Students' Tours.—Five educational tours of distant areas were conducted, each about one week duration; and half- or whole-day visits were made to machinery repair firms, saleyards, an aerial topdressing demonstration, the Soil Conservation Research Station, the abattoir, Cootamundra bacon factory, and wool stores and woollen mills.

Work as Stock Attendants, etc.—Students gained further experience by acting as stock attendants and/or by competing in stock or produce judging competitions at the Sydney Royal Show, the Wagga Show, Wagga Ram Show and Sales, the Wagga Angus Breeders' Show and Sales.

Curriculum, External Aid.—The College was assisted by:—Wagga Technical College in teaching Business Principles, Bookkeeping, Mechanics, Farm Engineering, Tractor Maintenance, Woodwork, Metalwork and Woolclassing; by the Division of Marketing and Agricultural Economics in teaching Economics and Farm Management; by the Division of Information Services in Leadership and Extension Methods training; by the Southern Regional Supervisor's staff in Apiculture and Poultry Raising; by Hawkesbury Agricultural College staff in Saddlery demonstrations; and all senior students received the benefit of two days' practical instruction in shearing from an outside specialist in this skill.

Some students were encouraged also to pursue extramural related studies in Meat Inspection, and Welding.

Suggested Course Modifications.—Proposals made last year for sweeping amendments, to the course as a whole, remain under discussion at Parliamentary level.

Winter Short-term Schools.—Schools conducted during the winter vacation were: the 10th annual "Turkey Raisers' School and Convention" (at this a plaque was unveiled in the Graham Block in recognition of services to the industry by Mr. G. W. Smith, a former Poultry Officer at the College; attendance, 51; and the 10th Junior Farmers' "School in Wheat and Sheep Husbandry"; attendance, 24.

Sydney University Students' School.—For the fifth time, Agricultural Science 2nd Year students from University of Sydney came into residence for two weeks' tuition in Farm Machinery and practical Animal Husbandry; attendance, 33.

Students' Extra-curricular Activities.—The regular annual competitive sports of the area were engaged in by students.

The College was host this year to the other five Agricultural Colleges competing in intercollegiate tennis matches and in rifle shooting.

All new students participated in the seventh annual First Aid course and examination, conducted by officers of Wagga District Ambulance Service.

Intramural debating and public speaking contests were held; and a challenge was accepted to debate with Wagga Wagga High School.

College Annual Field Day.—This was held in October and well attended. Its success was aided by the co-operation from the Regional Advisory Service and the Agricultural Research Institute.

Swimming Pool Fund.—This now stands at £6,200; an increase by £3,200 in this past year. It was helped substantially by the students and staff staging a successful Carnival Day. It netted £1,650. A preliminary survey of the pool site has been made by Public Works Department.

Works and Improvements.—Extension of lawns and planting of shrubs, and good growth of established lawns and shrubs, have brought the landscape plan closer to fruition.

The groundsman's facilities have been improved and augmented; a driveway section and another 20 chains of College roads have been formed and sealed; the upper lecture room floor, Eastern Block, has been soundproofed and laid with linoleum; and considerable brightening by painting has occurred in many parts.

Site for Irrigation Projects.—A preliminary survey of the site for the irrigation project has been done by Public Works Department.

Sectional Operations at Wagga

COLLEGE FARM

Silage Research Project.—Some of the lecturing staff with the assistance of Farm Section ran a "pilot" experiment involving six small silos, to determine techniques to be used in the Research Project. Results of the series are being assessed.

The Cereal Season.—The season has been most favourable for cereal crop production, but not for pasture hay and silage. It enabled ample student instruction in all phases of land preparation, sowing and harvesting of cereal crops; but limited their experience of fodder conservation from pastures.

Grain Production.—Phenomenal grain yields were obtained. The yield averages for wheat, oats and barley were the highest ever recorded at this institution.

Crop	Acres	*Production* Bushels	*Yield average* Bushels per acre
Wheat	156	5,884	37.8
Oats	153	7,230	47.25
Barley	30	1,377	45.9
Total ..	339	14,491	42.7

Most of the grain has been stored for College livestock feed; but 274 bushels of wheat, 504 bushels of oats and 235 bushels of barley have been distributed as pure seed to other Departmental Farms and to private cereal growers.

Hay and Silage Production.—The 74 acres of cereal crop cut for hay produced 115 tons; and 80 tons of silage was made from the oat crop.

Fifty tons of hay and 30 tons of silage were cut from pastures, and 90 tons of hay was cut from lucerne stands.

Pastures.—An additional area of 60 acres was sown to improved pastures. This brought the total of such pasture to 934 acres (710 acres in 1959 and 875 acres in 1960).

Lucerne.—Lucerne stands have been increased to 244 acres by sowing a further 27 acres.

Farm Improvements.—A further 110 chains of old boundary fencing has been replaced with a new rabbit-proof fence, and 45 chains of new subdivision fencing has been erected.

Farm-water supply has been considerably improved by construction of two concrete storage tanks, each of 20,000 gallons capacity.

Approximately 400 tree seedlings were planted in the College drive and paddocks.

Additional Farm Equipment.—Plant has been considerably increased by: purchase of a 45-horsepower tractor, a 14-furrow disc plough, a 6-ft. mower, a 32-ft. grain auger, an 18-tyne scarifier, and a cubic-yard earth scoop. A Fiat 411R tractor loaned to the College by British Farm Equipment Co. (N.S.W.) has been very useful.

Orchard Section

Greater Water Storage and Reticulation.—Water storage has been increased by 3,000 gallons, and extended reticulation will allow an increase in the nursery site, and facilitate routine spray operations.

Apple Rootstock Trial.—This demonstrated to students the preference of scions for particular stocks, and for particular methods of propagation.

Prune Rootstocks.—The effects of stocks on D'Agen prunes have been evaluated and incorporated in a report. The report also describes in detail the various plum stock selections.

Bud-transmitted Virus in Plum Stocks.—In this project some peculiar effects have been noted. They are subject of further study by Biology Branch, Division of Science Services.

Veterinary Section

Pigs.—The section remains under quarantine because of the presence of rhinitis, and the attempt to exclude swine fever.

High mortality of young pigs and some infertility problems have been under investigation. Eradication of swine pneumonia has not yet succeeded.

Routine tests for tuberculosis and contagious abortion were conducted.

Beef Cattle.—Main activities were vaccination with Strain 19, tuberculosis-testing of all stock, and the annual inspection for Johne's disease.

Dairy Cattle.—A suspected case of vibriosis was noted on 9th June, 1961. Continued trouble with mastitis and some cases of acute gastro-enteritis were the other main troubles. Routine tuberculin tests and Strain 19 vaccinations were done.

The first artificial insemination of Jersey cows at Wagga Agricultural College was effected between November, 1960, and January, 1961.

Poultry.—Fowl pox vaccination was administered to 800 head of fowls, and routine pullorum testing was done. A high incidence of pullorum was revealed but the source of infection was not found.

Turkeys have been treated, with little success, for an obscure respiratory disease. The low hatchability of turkey eggs has been under investigation.

Sheep.—The investigation of infertility in Dorset Horn ewes continued, with inconclusive results.

Stud Horses.—Vaccinations were administered against strangles and tetanus.

Dairy Section

Herd Production.—Production increased, wholly due to a favourable spring. From 34 cows completing a test of 300 days lactation, an average of 440 lb. of butterfat (398 lb. in 1959-60) and 8,769 lb. of milk (7,929 lb. in 1959-60) was obtained.

"Wagga Pinnacle's Jessica" topped the herd as a mature cow, with 609 lb. butterfat and 11,310 lb. milk in 300 days.

Herd Numbers.—Natural increase in the herd was 35 females and 25 males, including six stillborn. The herd totalled 134 at 30th June, 1961: 53 cows, six bulls, and 75 calves of both sexes.

Four Jersey females were purchased from Warrawong Stud, Berry.

Sales of Stock.—Sales (to the value of £1,705) comprised 20 males and 10 females. Culls included four bulls and eight cows. Demand far exceeds supply. The long waiting list will exceed the anticipated supply for the next two years.

Bull Loan for Artificial Breeding Station.—One bull was loaned to the N.S.W. Milk Board for artificial breeding.

Competitive Exhibits.—The College Jersey exhibits at Wagga Show gained the awards of:—Champion and Reserve Champion cow, Reserve Champion bull, Best Uddered cow, all breeds, and Champion Dairy cow, all breeds.

Seven animals were exhibited at Sydney Royal Show. One second and one fourth prize were gained.

Experiments.—Recording of birth weights and measurements of newly-born calves has been continued.

A Solids-not-Fat trial commenced in July, 1960, has yielded interesting data indicating a high level of S-N-F throughout the herd.

A staphylococcal mastitis vaccination trial was commenced. Results so far are inconclusive.

New Equipment.—Main items include a stainless-steel "Nuclear" type Releaser and four new stainless-steel milk droppers for the milking machine, a new model Lister separator with built-in motor and clutch, power-driven feed mixer.

Piggery Section

Developments.—These include a new office and store handy to the new piggery site, a steel hayshed structure, new gates on pens and yards, installation of automatic drinkers, concrete walls around farrowing pens, concreting floors outside sheds, and concrete feeding blocks.

Competitive Exhibits.—Awards gained at the Wagga Show were: a Champion, a Reserve Champion, six Firsts, two Seconds, and two Thirds.

Stud Horse Section

Stock Numbers.—At 30th June, 1961, they numbered 79, comprising eight entires, 46 mares, 15 foals and 10 geldings.

Sales and Transfers.—One colt was sold to New Guinea for 300 guineas, and one was transferred to Hawkesbury Agricultural College as a sire, together with two geldings for hacks.

Competitive Exhibits.—At the 1961 Sydney Royal Show a notable success was achieved by the College, as the first Arab stud ever to gain the first prize for both colts and fillies. A third also was awarded, in the fillies class.

Service of Private Mares.—Nine mares were accepted for service in the 1960 season.

BEEF CATTLE SECTION

Stock Numbers.—At 30th June, 1961, they totalled 100, comprising nine bulls, 65 cows and 26 calves.

Sales and Transfers.—Eight bulls were sold. They brought 2,325 guineas, with an average of 290 guineas.

Grade stock disposed of included one bull, two steers and one heifer, for a total of £223.

Transfers to other farms, because of the poor season, comprised 34 head of grade and cull cattle.

Prize Bull Purchase.—The white bull "Progorang Icicle" (First prize in the 'under 15 months and over 12 months" class) was purchased at the 1961 Sydney Royal Show for 1,300 guineas.

Competitive Exhibits.—One Second prize was gained at the 1961 Sydney Royal Show ("bull under 12 months").

A First and a Third prize were gained "on the hook" in the fat steer section.

SHEEP SECTION

Flock Numbers.—Flock numbers, substantially the same as for the previous year, varied between 1,000 and 1,400.

Transfer of Rams.—Dorset Horn flock rams were supplied to other Departmental institutions.

Ram Purchases.—Two stud rams were purchased, each at 150 guineas.

Competitive Exhibits.—In five placings from seven entries in the Wagga Show, there were three Firsts, one Second and one Third.

Research.—The Sheep Section continues to co-operate with the C.S.I.R.O. in a trial involving variable stocking rates on different pasture mixtures.

POULTRY SECTION

New Turkey Demonstration Unit.—This was officially opened. It has been stocked to capacity, and provided useful information. Electric lighting in breeding pens enabled earlier hatching this season. Methods of feeding poults are being demonstrated.

Sale of Breeding Turkeys.—The demand for breeding turkeys has increased, all orders have been filled.

Other Improvements.—Permanent water supply has been connected to the turkey range yards now under construction. An automatic plucking machine has modernised the killing room.

GRAHAME EDGAR, Director-General.

18th October, 1961.

APPENDICES

1. Accounts of the Department of Agriculture, 1960-61.
2. The Published Matter, of officers of the Department of Agriculture, 1960-61.

EXPLANATORY

Mr. Minister,

This Report is headed "Report of the Under Secretary to the Minister for the year ended 30th June, 1961".

It is my pleasant duty to sign it at this date, 18th October, 1961, although it is in effect the Report of the preceding Permanent Head, retired Under Secretary, Mr. E. O. Tout.

You are aware that, in the interim between the end of the twelve months under report and this date, Mr. Tout reached retirement age and that his last day of official duty was 18th August, 1961.

I am privileged now to present to you this Report of the Department of Agriculture for the final fiscal year of Mr. E. O. Tout's custodianship.

Yours faithfully,

GRAHAME EDGAR, Director-General.

18th October, 1961.

APPENDIX I

The Accounts of the Department of Agriculture, 1960–61

The cost of maintaining the Department of Agriculture is met from the Consolidated Revenue Fund, whilst capital expenditure on buildings and permanent improvements to departmentally-owned property is financed from the General Loan-Account. In addition to these general classifications of expenditure, the Department is assisted in the financing of certain specified lines of research and development and the control of insect pests and animal diseases by direct levies on industry and by grants from the Commonwealth Government and public and private organisations. Operations of this nature are reflected in a large number of separate accounts within the general Treasury classification of " Special Deposits Account ", some details of which are given elsewhere in this Appendix.

COMPARATIVE STATEMENT OF EXPENDITURE

Account	1959-60	1960-61	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Consolidated Revenue Fund	3,693,323 1 6	4,023,337 12 10	330,014 11 4 (Increase)
General Loan Account	114,353 5 5	118,204 9 6	3,851 4 1 (Increase)
£	3,807,676 6 11	4,141,542 2 4	£333,865 15 5 (Increase)

EXPENDITURE FROM CONSOLIDATED REVENUE FUND

The following tabulation is a comparison of expenditure by the functional Divisions of the Department for the last two financial years :—

Division	1959-60	1960-61	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Central Administration	757,732 6 3	719,361 14 2	38,370 12 1 (Dec.)
Science Services	....	151,374 15 10	151,374 15 10 (Inc.)
Plant Industry	228,224 12 8	240,250 15 1	12,026 2 5 (Inc.)
Horticulture	198,111 7 2	209,117 2 2	11,005 15 0 (Inc.)
Dairying	195,498 19 8	212,856 1 8	17,357 2 0 (Inc.)
Hawkesbury Agricultural College	221,332 18 7	245,225 10 4	23,892 11 9 (Inc.)
Wagga Agricultural College	107,842 9 7	120,446 18 6	12,604 8 11 (Inc.)
Experiment Farms and Stations	385,994 13 4	425,144 18 5	39,150 5 1 (Inc.)
Animal Industry—			
Head and District Offices	485,687 10 11	540,773 12 11	55,086 2 0 (Inc.)
Queensland Border	62,658 1 6	85,770 1 11	23,112 0 5 (Inc.)
Tick Quarantine Areas	908,819 19 4	941,152 7 3	32,332 7 11 (Inc.)
Royal Botanic Gardens	141,420 2 6	131,863 14 7	9,556 7 11 (Dec.)
Totals £	3,693,323 1 6	4,023,337 12 10	330,014 11 4 (Inc.)

The Division of Science Services, the cost of which has been provided for under Central Administration in previous years, was included in the 1960–61 appropriations as a separate Division.

Salaries and wages continued to rise during the year and this, combined with the resultant increase in the cost of goods and services, accounts for an overall increase in expenditure as compared with the previous year.

Maintenance of buildings and properties is continuing and the expenditure for this purpose at the Hawkesbury and Wagga Agricultural Colleges and the Experiment Farms and Stations was greater than in the year 1960–61.

Following upon certain investigations into the most effective method of dealing with the cattle tick problem, a control campaign was undertaken in the Tick Quarantine Areas. This involved greater expenditure than the holding campaign undertaken in the previous financial year and this is reflected in the figures for Division of Animal Industry—Tick Quarantine Areas.

EXPENDITURE FROM GENERAL LOAN ACCOUNT

Expenditure from General Loan Account for the year was £118,204 9s. 6d., of which £18,208 5s. 1d. was spent at Hawkesbury Agricultural College; £25,802 5s. 1d. at Wagga Agricultural College; and £74,193 19s. 4d. at Experiment Farms and Stations; of which £28,138 0s. 0d. was expended on the establishment of the Tamworth Agricultural Research Station.

OTHER ACCOUNTS

SPECIAL DEPOSITS ACCOUNT

Following is a complete list of accounts and funds within the Special Deposits Account at the Treasury on which this Department operates:—

Name of Account	Balance as at 1st July, 1960	Receipts 1960-61	Payments 1960-61	Balance as at 30th June, 1961
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Advances to Officers for Purchase of Motor Cars	*Dr. 104,363 5 5*	49,351 0 4	50,952 10 6	*Dr. 105,964 15 7*
Contribution towards Running Expenses of Tractor Mower at Centennial Park	272 8 10	74 0 0	141 12 4	204 16 6
Potato Growers' Licensing Act, 1940	968 12 6	1,720 7 0	1,875 6 2	813 13 4
Balance of Salaries Adjustment Suspense Account	19,685 2 5	32,995 11 2	19,685 2 5	32,995 11 2
Government Printing Office—Working Account and Stores Account and Sale of Publications	....	1,053 5 6	72 9 6	980 16 0
Noxious Insects Destruction Account	31,573 7 10	69,281 6 8	55,871 13 6	44,983 1 0
Swine Compensation Fund	102,751 10 10	16,422 0 2	64,893 1 8	54,280 9 4
Treasury Fire Risks	....	....	384 2 8	*Dr. 384 2 8*
Government Advertising	....	5 0 0	....	5 0 0
Hawkesbury Agricultural College Canning Factory Account	1,210 12 10	2,090 19 4	2,243 0 9	1,058 11 5
Bush Fire and Flood Relief Account (State)	9,710 9 10	7,000 0 0	6,529 12 4	10,180 17 6
Hawkesbury Agricultural College—Dairying Factory Working Account	34,400 2 10	159,277 1 4	148,200 9 0	45,476 15 2
Tobacco Industry Trust Account	13,252 1 2	20,014 5 0	12,209 4 6	21,057 1 8
Commonwealth-State Bush Fire Relief Scheme	7,871 17 5	....	7,871 17 5	....
Pasture Control Account	8,200 0 0	21 10 8	....	8,221 10 8
Unclaimed Moneys Account	546 11 7	633 15 5	392 11 4	787 15 8
Commonwealth Grant Towards the Promotion of Improved Practices in the Dairying Industry	9,715 10 3	65,326 7 5	66,167 9 9	8,874 7 11
Argentine Ant Eradication Campaign	1,664 17 6	....	363 16 8	1,301 0 10
Commonwealth Grant—Expansion of Agricultural Advisory Services—New South Wales	22,018 18 11	81,004 4 0	79,401 4 5	23,621 18 6
Cattle Compensation Fund	237,783 2 8	345,035 1 0	206,608 14 0	376,209 9 8
V. P. Bragg Scholarship—Wagga Agricultural College	179 14 8	307 10 0	430 0 0	57 4 8
Wagga Agricultural College Swimming Pool Account	199 0 0	3,643 17 0	3,500 0 0	342 17 0
V. P. Bragg Scholarship Account (Investment)	6,000 0 0	....	....	6,000 0 0
Wagga Agricultural College Swimming Pool Account (Investment Account)	2,000 0 0	3,500 0 0	....	5,500 0 0
Egg Marketing Board for the State of New South Wales—By-Election	....	361 4 5	359 10 10	1 13 7
Poll on Question of the Constitution of a Honey Marketing Board for New South Wales	*Dr. 2 8 0*	102 17 4	100 9 4	....
Wine Grapes Marketing Board for the Shires of Leeton, Wade and Carrathool—Triennial Elections, 1959	*Dr. 58 15 5*	59 3 4	7 11	....
Argentine Ant Eradication Campaign	*Dr. 2,914 0 0*	....	....	*Dr. 2,914 0 0*
Water Supply—Shannon Vale Nutrition Station	*Dr. 960 0 0*	960 0 0	....	....
Extending Water Supply and Construction Sheep Dip and Draining Pens at Shannon Vale Nutrition Station	*Dr. 602 14 9*	604 1 11	1 7 2	....
Purchase in Bulk the Yearly Requirements of Sodium Fluoroacetate (1080) Rabbit Poison for use of Pastures Protection Boards	....	6 16 6	6 16 6	....
Additional Poultry Housing for Random Sample Tests at Hawkesbury Agricultural College	....	....	3,700 0 0	*Dr. 3,700 0 0*
Hawkesbury Agricultural College Trust Account	3,125 19 6	7,695 3 5	6,209 0 5	4,612 2 6
Wagga Agricultural College Trust Account	1,799 10 11	2,209 2 10	2,481 7 6	1,527 6 3
Advertising—Department of Agriculture Publications Account	1,123 16 6	10,829 5 2	10,193 14 5	1,759 7 3
Trust Fund—Brown Rot Investigations	430 14 11	1,180 0 0	369 5 7	1,241 9 4
Commonwealth Contribution for Research into Control of Insecticidal Resistance in Sheep Blowfly	1,277 0 9	1,200 0 0	678 15 11	1,798 4 10
Commonwealth Contribution for Research into Control of Itch Mite in Sheep	1,477 2 1	2,825 0 0	1,989 19 2	2,312 2 11
Commonwealth Grant for Additional Sheep and Wool Advisory Officers	2,625 0 0	5,500 0 0	6,219 17 3	1,905 2 9
Commonwealth Grant for Appointment of Wheat Geneticist at Wagga Agricultural Research Institute	35 5 4	50 0 0	60 12 7	24 12 9
Commonwealth Grant for the Development of a Rotary Sod-Seeder	400 0 0	....	....	400 0 0
Contribution by Commonwealth Towards Cost of Investigations into Excess Spray Residue on Fruit	2,288 9 9	492 0 0	2,276 3 7	504 6 2
Contribution by C.S.I.R.O. towards Fleece Testing work at Trangie	340 0 0	....	340 0 0	....
Contribution by Legume Inoculant Association towards Research and Service in the Field of Rhiziobiology	20 13 0	....	11 3 0	9 10 0
Contribution by Manning District Agricultural Research Council for Pasture Research in Manning District	2,000 0 0	....	948 8 3	1,051 11 9
Contribution towards Animal Insect Pest Investigations—Glenfield Veterinary Research Station	521 13 11	....	....	521 13 11
Contributions by States towards Salary and Expenses of Patrol Officer, Grasshopper Control	3,369 14 1	....	2,074 12 8	1,295 1 5
Contributions for Plague Locust Trial Control Campaign	36,107 6 9	....	....	36,107 6 9

Special Deposits Account—*continued*

Name of Account	Balance as at 1st July, 1960	Receipts 1960-61	Payments 1960-61	Balance as at 30th June, 1961
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Contributions for Research in Agronomy—Hawkesbury Agricultural College	....	100 0 0	....	100 0 0
Contributions to Pasture Research Programme—Mid-Coast and Hunter Region	2,141 10 4	145 10 6	795 14 10	1,491 6 0
Contributions towards Cost of Trip Overseas by Dr. C. J. Magee	443 15 6	197 3 3	640 18 9	....
Contributions towards Development of Tamworth Experiment Station	6,000 0 0	19,000 0 0	15,989 14 3	9,010 5 9
Contributions towards Establishment of Library at Agricultural Research Institute, Wagga	36 15 0	....	....	36 15 0
Department of Agriculture Suspense Account	869 15 2	30,968 8 3	10,406 3 6	21,431 19 11
Donation by I.C.I.A.N.Z. towards Pasture Fertiliser Nitrogen Investigations	233 5 5	24 10 7	9 8 8	248 7 4
Egg Marketing Board—Contribution for Investigations into Egg Quality	735 4 9	43 5 3	778 10 0	....
Fire Damage Account	240 12 10	....	....	240 12 10
Grant by Australian Dairy Produce Board for Research Projects	3,400 0 0	15,675 0 0	14,622 19 0	4,452 1 0
Grant by New South Wales Wheat Industry Research Committee to Agricultural Research Institute, Wagga, for Frost Resistance Investigations	6,100 0 0	....	753 16 3	5,346 3 9
Grant by Wool Research Committee—Efficiency of Wool Production and Influence of Season on Ram Fertility	....	1,635 0 0	899 0 0	736 0 0
Grant by Wool Research Committee for Black Soil Scarab Investigations	....	625 0 0	305 10 5	319 9 7
Grant by Wool Research Committee for Research in Galvanised Burr Control	1,181 9 9	750 0 0	810 13 0	1,120 16 9
Hawkesbury Agricultural College Egg Laying Competition Prize Fund	767 12 2	4,390 10 0	3,081 6 4	2,076 15 10
Hawkesbury Agricultural College Swimming Pool	8,088 14 4	....	5,962 19 8	2,125 14 8
Horse Breeding Fund	142 18 10	....	....	142 18 10
I.C.I.A.N.Z. Scholarship in Animal Husbandry, Wagga Agricultural College	....	100 0 0	100 0 0	....
McGarvie Smith Institute—Contribution to Nutritional Research Laboratory, Glenfield	543 1 6	....	543 1 6	....
National Heart Campaign Appeal	....	1,039 5 8	984 19 6	54 6 2
New South Wales Wheat Industry Research Committee Grant for Black Soil Scarab Investigations	1,608 0 0	1,012 0 0	1,617 6 7	1,002 13 5
N.S.W. Wheat Industry Research Committee—Grant for expanded Wheat Research Projects, Wagga Agricultural Research Institute	1,108 10 6	7,750 0 0	7,036 12 0	1,821 18 6
New South Wales Wheat Industry Research Committee Grant for Skeleton Weed Research	244 16 11	....	140 16 6	104 0 5
Pastures Protection Boards of New South Wales—Subsidy to Glenfield Veterinary Research Station	*Dr.* *49 6 11*	2,708 0 0	2,575 4 9	83 8 4
W. S. Pender Memorial Fund—Interest on Bonds	78 12 9	41 18 9	3 2 6	117 9 0
Rice Research Laboratory, Yanco	286 0 0	....	....	286 0 0
Shannon Vale Nutrition Station Working Account	3,683 7 11	4,594 12 6	4,392 18 1	3,885 2 4
Tropical Fruit Research Station	4,995 10 0	....	777 0 1	4,218 9 11
Unclaimed Salaries and Wages	398 11 3	2,213 4 4	2,088 19 5	522 16 2
Wheat Industry Research Council Grant for Investigation into Possibilities of Segregation of Wheats on the Basis of Quality	247 0 1	3,300 0 0	3,054 3 3	492 16 10
£	*501,571 4 1*	*989,145 6 0*	*844,186 9 10*	*646,530 0 3*

Brief details of the legislation covering some of the more important aspects of these accounts, together with short histories of the operations conducted under each of them, were given in the Annual Report for 1957-58.

The following additional information is now offered in respect of such of the accounts as appear to warrant further amplification:—

Swine Compensation Fund

	£ s. d.
Balance at 1st July, 1960	102,751 10 10
Receipts—	
Stamp Duty	16,422 0 2
	119,173 11 0
Disbursements—	
Swine Compensation	64,893 1 8
Balance as at 30th June, 1961	£54,280 9 4

The income from stamp duty fell by £5,154 6s. 1d. as compared with 1960–61. An outbreak of Swine Fever toward the close of the year caused a steep rise in the amount paid in compensation, which up to that stage had been approximately the same as the preceding year at the same date. The increase amounted to £44,617 9s. 5d.

Cattle Compensation Act, 1951 (as amended)

Disease	Claims			Animals			Payments		
	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total
							£ s. d.	£ s. d.	£ s. d.
Tuberculosis	1,630	802	2,432	5,106	1,490	6,596	81,892 12 3	38,259 1 1	120,151 13 4
Cancer	1,685	197	1,882	2,214	229	2,443	34,402 12 11	5,288 0 7	39,690 13 6
Actinomycosis	1,478	6	1,484	1,733	6	1,739	24,047 12 6	164 3 4	24,211 15 10
Actinobacillosis	325	2	327	381	2	383	5,163 5 1	58 18 0	5,222 3 1
Pleuro Pneumonia Contagiosa	6	1	7	8	1	9	265 0 0	31 10 0	296 10 0
Trichomoniasis	7	..	7	11	..	11	142 1 8	....	142 1 8
Tick Fever	..	..	..	..	..	..	....	....	....
Johne's Disease	9	..	9	59	..	59	1,082 16 11	....	1,082 16 11
Vibriosis	..	..	..	..	..	..	....	....	....
Totals	5,140	1,008	6,148	9,512	1,728	11,240	£146,996 1 4	43,801 13 0	
Net Compensation paid									£190,797 14 4

SUMMARY OF RECEIPTS AND PAYMENTS

	£ s. d.	£ s. d.
Balance of Fund as at 1st July, 1960	......	237,783 2 8
Add Receipts—		
Levy	253,479 19 7	
Sale of Stamps	91,555 1 5	
		345,035 1 0
		582,818 3 8
Less Payments—		
Compensation	190,797 14 4	
Legal Cost	22 18 0	
Administrative Costs—		
Pastures Protection Board Secretaries' allowances (1st July, 1960, to 31st December, 1960)	1,062 10 0	
Department of Agriculture	14,725 11 8	
		206,608 14 0
Balance of Fund as at 30th June, 1961		£376,209 9 8

Commonwealth Dairy Industry Extension Grant

The continuance of this grant has been approved to 30th June, 1963, under the terms and conditions set out in the Department's report for the year ended 30th June, 1953.

The first grant was received in October, 1948, and the expenditure to 30th June, 1961, amounted to £825,072 8s. 2d. under the following headings :—

Item	1948-49 to 1959-60	1960-61	Total
	£ s. d.	£ s. d.	£ s. d.
Organising Officers	134,027 14 2	10,534 4 5	144,561 18 7
General Publicity	70,922 4 5	7,777 4 6	78,699 8 11
Demonstrations	160,112 17 10	4,303 1 7	164,415 19 5
Competitions	7,437 7 4	....	7,437 7 4
Field Days	88 15 7	....	88 15 7
Herd Recording	216,831 17 10	25,952 0 0	242,783 17 10
Artificial Insemination	60,075 15 3	....	60,075 15 3
Statistical Work	18,034 1 9	....	18,034 1 9
Herd Surveys	26,165 6 8	....	26.165 6 8
Punch Card Equipment	24,240 18 5	2,059 17 6	26,300 15 11
Milking Machine Survey	13,483 9 7	8,291 16 11	21,775 6 6
Contribution towards attendance of representative at International Study Centre	400 0 0	....	400 0 0
Contribution towards attendance of representative at Maryland University	806 16 3	....	806 16 3
Milking Machine Testing Station	4,882 14 5	....	4,882 14 5
Survey—Infertility in Dairy Herds	4,284 1 10	2,792 3 0	7,076 4 10
Agricultural Trainees	12,000 0 0	4,000 0 0	16,000 0 0
Sire Survey	980 13 2	452 6 10	1,433 0 0
Overseas Visit of Senior Women's Extension Service Officer	1,127 13 11	....	1,127 13 11
Testing Stations—Air-flow Meters	2 10 0	4 15 0	7 5 0
Publication of Book "Weeds"	3,000 0 0	....	3,000 0 0
£	758,904 18 5	66,167 9 9	825,072 8 2

Commonwealth Grant—Expansion of Agricultural Advisory Services—N.S.W.

The Commonwealth agreed to make grants to the States to permit of the expansion of the Agricultural Advisory Services. Initially the grants were for a five year period ended 30th June, 1957. They have been continued and the current agreement will terminate on 30th June, 1965.

Expenditure to 30th June, 1961, amounted to £521,571 10s. 6d. under the following headings:—

Item	1952-53 to 1959-60	1960-61	Total
	£ s. d.	£ s. d.	£ s. d.
Crop and Pasture Demonstrations	87,545 15 11	1,668 0 2	89,213 16 1
Livestock Demonstrations	23,509 5 0	1,843 4 0	25,352 9 0
Horticultural Demonstrations	11,587 9 7	1,473 18 1	13,061 7 8
Agricultural Machinery Demonstrations	17,183 14 6	3,579 2 10	20,762 17 4
Irrigation Equipment and Demonstrations	1,074 13 8	26 2 9	1,100 16 5
Field Assistants and Motor Vehicles	127,838 5 3	36,325 19 2	164,164 4 5
Extension Aid Equipment	33,391 15 6	3,712 0 11	37,103 16 5
Publicity Officer	51,561 19 1	14,732 19 11	66,294 19 0
Production of Agricultural Publications	22,955 13 10	4,646 8 11	27,602 2 9
Production of Agricultural Films	2,870 17 1	....	2,870 17 1
Purchase of Books	6,286 9 10	1,404 8 7	7,690 18 5
Overseas Visits of Agricultural Officers	7,056 18 6	1,804 7 2	8,861 5 8
Agricultural Trainees and Cadets	43,457 8 11	6,935 14 6	50,393 3 5
Administration	5,849 19 5	1,095 4 11	6,945 4 4
Water and Soil Testing	....	153 12 6	153 12 6
Totals £	442,170 6 1	79,401 4 5	521,571 10 6

Noxious Insects Destruction Account

The Noxious Insects Act of 1934 provides for the striking of a levy under specified conditions, as a contribution towards the cost of suppression and destruction of noxious insects. The revenue is paid into Special Deposits Account and moneys at the credit of this Account are applied by the Minister for the purposes prescribed in the Act.

During the financial year 1959-60 heavy expenditure was incurred in dealing with a grasshopper plague and the Treasury made a "recoverable advance" to the fund pending the receipt of moneys from the levies which were struck. The rates of the levies were increased for the 1960 calendar year and the additional income is reflected in the figures for 1960-61 financial year. Sufficient revenue was received to permit of repaying the Treasury Advance during 1960-61.

Following is a Statement of Receipts and Payments for the year 1960-61:—

RECEIPTS		PAYMENTS		
	£ s. d.		£ s. d.	£ s. d.
Balance at 1st July, 1960	31,573 7 10	Poison and Materials	5,412 15 3	
Levies	69,281 6 8	*Less* Refund on Drums	2 0 0	
				5,410 15 3
		Maintenance of Motor Vehicles		189 12 7
		Cartage		179 17 9
		Travelling Expenses		65 17 6
		Advertising		16 19 0
		Payroll Tax 1959-60		8 11 5
		Repayment of State Treasury Advance		50,000 0 0
		Balance at 30th June, 1961		44,983 1 0
	£ 100,854 14 6			£ 100,854 14 6

Pastures Protection Boards of New South Wales—Subsidy to Glenfield Veterinary Research Station

Receipts and payments for the year ended 30th June, 1961, were:—

RECEIPTS		PAYMENTS	
	£ s. d.		£ s. d.
Balance as at 1st July, 1960	600 13 1	Salaries	2,408 10 11
Grants	2,058 0 0	Workers' Compensation Insurance Premium	17 8 1
		Travelling Expenses	51 0 0
		Advertising	40 11 0
		Payroll Tax, 1959–60	57 14 9
		Balance as at 30th June, 1961	83 8 4
	£2,658 13 1		£2,658 13 1

Potato Growers' Licensing Act, 1940 (as amended)

Transactions on this Account for the year 1960-61 were:—

RECEIPTS	£	s.	d.
Balance as at 1st July, 1960	968	12	6
Licence Fees	1,717	7	0
	£2,685	19	6

PAYMENTS	£	s.	d.
Grants to Potato Growers' Association	1,700	0	0
Administrative Costs, 1959-60	90	4	0
Postages	82	2	2
Balance at 30th June, 1961	813	13	4
	£2,685	19	6

Shannon Vale Nutrition Station—Working Account

Statement of Receipts and Payments for the year ended 30th June, 1961:—

RECEIPTS	£	s.	d.	£	s.	d.
Balance at 1st July, 1960	......			3,683	7	11
Sale of Wool	3,845	13	10			
Sale of Livestock	679	0	5			
Sale of Skins	10	5	7			
Sale of Seed	24	15	0			
				4,559	14	10
Rent of Cottage				34	17	8
				£8,278	0	5

PAYMENTS	£	s.	d.
Wages	1,344	9	2
Workers' Compensation Insurance Premiums	49	4	0
Payroll Tax, 1959-60	37	17	8
Travelling Expenses	9	0	0
Building, Fencing and Repairs	78	11	4
Freight and Cartage	176	5	3
Motor Spirit	95	3	4
Fertilizers	493	10	0
Cattle Troughs	173	2	4
General Supplies	300	6	2
Insurance on Tractor—Third Party and Comprehensive	8	4	7
Plant Purchases, Maintenance and Repairs	63	2	4
Final Repayment of Advance by State Treasury for Provision of Water Supply	1,564	1	11
Balance at 30th June, 1961	3,885	2	4
	£8,278	0	5

OTHER ACCOUNTS

Contribution by Milk Board to meet cost of Herd Testing for Tuberculosis

Although these operations are within the framework of the Consolidated Revenue Fund, separate accounts are kept in the Department to show the annual financial result. Following is a Statement of Receipts and Payments for the year ended 30th June, 1961, in respect of this service:—

RECEIPTS	£	s.	d.
Balance of contributions from Milk Board at 1st July, 1960, being overpayment of 1959-60 contribution	685	15	6
Contributions received, 1960-61	3,814	4	6
Balance at 30th June, 1961, payable by Milk Board	502	8	0
	£5,002	8	0

PAYMENTS	£	s.	d.
Salaries	3,819	14	9
Employer's Proportion of Superannuation Contributions	286	5	8
Travelling Expenses	701	3	5
Postages and Telephones	9	13	4
Printing	1	6	7
Workers' Compensation Insurance Premiums	71	3	10
Payroll Tax	113	0	5
	£5,002	8	0

Veterinary Surgeons' Act, No. 25 of 1923

The Act provides for the establishment of a Board to be called " Board of Veterinary Surgeons of New South Wales ." Fees and penalties collected under the Act are paid to the credit of Consolidated Revenue Fund, from which administrative expenses are met. There were 437 registered Veterinary Surgeons at 30th June, 1961.

Receipts and Payments for the financial year 1960-61 were:—

RECEIPTS	£	s.	d.
Registration Fees	26	5	0
Restoration Fees	6	6	0
Roll Fees	925	6	2
Examination Fees	42	0	0
	£999	17	2

PAYMENTS	£	s.	d.
Salaries	633	13	1
Members' Fees	121	16	0
Travelling Expenses	9	5	6
Postage	44	13	7
Printing	14	10	6
Fees for examination of Foreign Graduates	63	0	0
Excess of Receipts and Payments	112	18	6
	£999	17	2

Meat Inspection Service

This service is administered under the Meat Industry Act, 1915 (as amended) which makes provision for inspection fees.

The Metropolitan Meat Industry Board and the Department of Health bear the full cost of meat inspections at the State Abattoir, Homebush Bay, and Knackeries, respectively. Fees are charged in accordance with the provisions of the regulations for inspections carried out at Other Slaughterhouses.

The Statements of Expenditure and Income for the year ended 30th June, 1961, are in the process of being recast and are not available for inclusion in this report.

Fund Created by Wheat Marketing (Barring of Claims) Act of 1929 (as amended)—

REVENUE ACCOUNT FOR THE YEAR ENDED 30TH JUNE, 1961

	£ s. d.		£ s. d.
To Balance—Net surplus transferred to Accumulated Funds Account	1,742 19 3	By Interest on Investments (Government Securities)	1,674 2 2
		,, Bank Interest	68 17 1
	£1,742 19 3		£1,742 19 3

BALANCE SHEET AS AT 30TH JUNE, 1961

LIABILITIES	£ s. d.	ASSETS	£ s. d.
Accumulated Funds as at 1st July, 1960	43,753 13 2	Investments in Government Securities (face value)	40,520 0 0
Net Surplus for the year ended 30th June, 1961	1,742 19 3	Balance at Commonwealth Savings Bank	4,558 6 0
		Interest accrued to 30th June, 1961	418 6 5
	£45,496 12 5		£45,496 12 5

STATEMENT OF RECEIPTS—CONSOLIDATED REVENUE FUND—FINANCIAL YEAR, 1960-61

Institution	Sale of Farm Produce and Livestock, etc.	Students' Fees	Rents, etc.	Other Receipts	Net Receipts
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Hawkesbury Agricultural College	20,675 5 0	34,933 17 3	4,968 17 7	4,808 19 6	65,386 19 4
Wagga Agricultural College	14,043 7 9	14,155 11 5	7,289 15 7	629 15 9	36,118 10 6
Alstonville Tropical Fruit Research Station	......	......	170 15 9	......	170 15 9
Bathurst Experiment Farm	10,527 12 7	......	253 8 10	4 4 7	10,785 6 0
Condobolin Experiment Farm	5,577 18 2	......	175 15 5	164 7 9	5,918 1 4
Cowra Experiment Farm	6,057 5 1	......	200 4 11	37 18 10	6,295 8 10
Grafton Experiment Farm	8,526 13 11	......	338 18 5	137 19 3	9,003 11 7
Griffith Viticultural Nursery	614 9 11	......	45 8 11	......	659 18 10
Leeton Experiment Farm	8,165 11 4	......	237 8 8	8 4 6	8,411 4 6
Lower Murray Research Station	762 8 8	......	89 4 10	......	851 13 6
Narara Citrus Experiment Station	2,063 9 9	......	170 1 9	21 3 10	2,254 15 4
Narrabri Experiment Farm	......	......	372 17 6	......	372 17 6
New England Agricultural Research Station	4,887 0 9	......	641 8 11	140 2 9	5,668 12 5
Seven Hills Poultry Research Station	5,597 9 3	......	208 3 8	2 19 6	5,808 12 5
Tamworth Agricultural Research Station	749 19 8	......	173 11 8	......	923 11 4
Temora Experiment Farm	2,850 15 11	......	405 6 9	111 10 7	3,367 13 3
Trangie Agricultural Research Station	20,589 16 0	......	2,786 7 9	183 2 5	23,559 6 2
Wollongbar Agricultural Research Station	6,197 1 10	......	412 0 8	59 13 0	6,668 15 6
Yanco Agricultural Research Station	15,788 0 0	450 1 6	2,768 15 2	10 2 0	19,016 18 8
Total £	133,674 5 7	49,539 10 2	21,708 12 9	6,320 4 3	211,242 12 9

Statement of Receipts—Consolidated Revenue Fund—Financial Year 1960-61—*continued*

Division	Particulars	Net Receipts		
		£	s.	d.
Central Administration	Fees—Farm Produce Agents' Act, 1926-1932	307	4	0
	Fees—Fertilisers Act, 1934	257	4	0
	Fees—Apiary Registrations	2,587	3	5
	Fees—Pest Destroyers Act, 1945	640	10	0
	Fees—Registration of Stock Brands	1,493	3	3
	Fees—Registration of Swine Brands	311	3	5
	Fees—Stock Foods and Medicines Act, 1940	1,572	13	6
	Fees—Veterinary Surgeons' Act, 1923	999	17	2
	Fees—Public Officers'—Witness Expenses	67	0	1
	Fees—Analyses	59	14	0
	Fees—Flour Certificates	301	13	0
	Fines and Forfeitures	33	18	0
	Forfeitures of Bonds	2,318	6	1
	Commission for collection of Premiums—Group Assurance Scheme	933	8	2
	Commission for collection of Premiums—Hospital Contribution and Medical Benefits Funds	229	2	3
	Commission for collection of Judgment Debts	17	2	4
	Interest on Advances from A.D.W.A.	......		
	Sundry Sales	......		
	Sale of Government Property	1,064	17	4
	Transfer of Part Balances not required	......		
	Exchange on Cheques and Remittances	206	12	5
	Three per cent. Contribution by Pastures Protection Boards	20,920	14	10
	Broadcasting Fees	1	10	1
	License Fees—Pastures Protection Act	257	15	0
	Postages	68	16	5
	Employer's Liability to State Superannuation Fund	4,840	10	7
	Administration of Cattle Compensation Fund	14,725	11	8
	Fees—Public Officers'—Jurors	8	17	0
	Testing Air Flow Meters	8	8	0
	Other Miscellaneous Receipts	69	14	6
	Total £	54,302	10	6
Division of Plant Industry	Fees—Certification of Seed	7,043	2	3
	Fees—Certification of Bean Seed	599	0	0
	Fees—Certification of Sweet Sorghum Seed	209	10	6
	Fees—Certification of Sorghum Almum Seed	351	5	0
	Fees—Registration of Hybrid Seed Maize	2,284	7	0
	Fees—Seed Testing	414	5	4
	Commonwealth Contribution towards Administration of Plant Quarantine	1,779	11	8
	Total £	12,681	1	9
Division of Horticulture	Fees—Inspection—Plant Diseases Act	2,265	5	11
	Fees—Fumigation—Plant Diseases Act	42	12	8
	Fees—Certification of Seed Potatoes	1,186	13	8
	Contribution by Commonwealth Government—Administration of Commerce Act	12,260	17	8
	Administration of Plant Quarantine	30,407	6	4
	Total £	46,162	16	3
Division of Dairying	Fees—Grading—Dairy Industry Act	3	10	1
	Fees—Licence—Dairy Industry Act	18	0	0
	Fees—Registration—Dairy Industry Act	6	5	0
	Fees—Dairy Science Schools	193	4	6
	Fees—Herd Recording	45,218	9	2
	Commonwealth Grant towards cost of Herd Recording	25,952	0	0
	Total £	71,391	8	9
Division of Animal Industry—Head and District Offices	Fees—Piroplasmosis Testing of Bulls	9	16	0
	Fees—Brucellosis Testing of Cattle	12	7	0
	Fees—Cattle Export	56	2	0
	Fees—Chicken Sexing Examinations	......		
	Fees—Pleuro pneumonia contagiosa Tests of Cattle	15	16	0
	Fees—Honey Certificates	36	10	6
	Fees—T.B. Testing of Cattle	75	4	6
	Fees—Vaccination of Calves	......		
	Fees—Testing for Johnin Disease	5	0	0
	Fees—Inspection of Pigs	......		
	Fees—Meat Inspection	256,647	0	6
	Contribution by Commonwealth Government—Administration of Animal Quarantine	16,236	2	1
	Contribution by Milk Board—T.B. Testing of Herds	3,814	4	6
	Rent—Pyrmont Depot	......		
	Glenfield Veterinary Research Station—			
	Sale of Farm Produce, etc.	4,631	18	7
	Telephone Calls (Private)	25	2	0
	Electricity supplied to Officers	135	14	2
	Exchange on Cheques and Remittances	2	1	8
	Rents	308	0	11
	Total £	282,011	0	5

Statement of Receipts—Consolidated Revenue Fund—Financial Year 1960-61—*continued*

Division	Particulars	Net Receipts		
		£	s.	d.
Division of Animal Industry—Queensland Border	Fees—Dipping Stock	8,518	7	0
	Rents	850	18	0
	Exchange on Cheques and Remittances	8	15	4
	Total £	9,378	0	4
Division of Animal Industry—Tick Quarantine Areas	Fees—Fumigation	2	8	6
	Rents	154	2	8
	Exchange on Cheques and Remittances	......		
	Contribution by Commonwealth Government in respect of Cattle Tick Eradication	521,388	2	10
	Sale of Government Property	......		
	Total £	521,544	14	0
Royal Botanic Gardens and Allied Activities	Rents—Exclusive of Land (Ground Fees, Kiosk Rents, etc.)	5,870	9	6
	Lavatory Takings	110	6	7
	Sale of Government Property	......		
	Rents	550	6	8
	Contribution by Commonwealth Government—Maintenance of Gardens at Admiralty House	5,619	12	0
	Total £	12,150	14	9
Department of Agriculture	Repayments to Credit of Vote—Previous Years—Hawkesbury and Wagga Agricultural Colleges and Experiment Farms	4,240	9	0
	Other	12,385	14	2
	Total £	16,626	3	2

SUMMARY OF RECEIPTS

Particulars	Net Receipts		
	£	s.	d.
Agricultural Colleges, Farms, Stations and Nurseries	211,242	12	9
Central Administration, Divisions, etc.	1,009,622	6	9
Department of Agriculture—Repayments to Credit of Votes—Previous Years	16,626	3	2
Total £	1,237,491	2	8

EXPENDITURE FROM CONSOLIDATED REVENUE FUND AND GENERAL LOAN ACCOUNT, 1960-61

(See Separate Statement for Expenditure from Special Deposits Account)

Section	Consolidated Revenue Fund				General Loan Account	Total Expenditure by Department of Agriculture	Expenditure by Other Departments						Grand Total Expenditure
							Consolidated Revenue Fund				General Loan	Total Expenditure by Other Departments	
	Salaries and Payments in the nature of Salary	Maintenance and Working Expenses other than Salaries	Other Services	Total			Government Stores Department (1)	Government Printer	Government Real Estate Office	Department of Public Works (2)	Department of Public Works		
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Central Administration	557,959 7 9	91,882 15 6	69,519 10 11	719,361 14 2	....	719,361 14 2	69,057 13 9	33,698 13 0	....	67,426 15 1	191,169 12 5	361,352 14 3	1,080,714 8 5
Division of Science Services	124,910 7 6	14,911 15 6	11,552 12 10	151,374 15 10	....	151,374 15 10	....	....	....	....	....	....	151,374 15 10
Division of Plant Industry	200,129 18 8	35,258 15 7	4,862 0 10	240,250 15 1	....	240,250 15 1	....	2,478 9 4	....	....	....	2,478 9 4	242,729 4 5
Division of Horticulture—													
Fruit	129,530 19 3	22,333 12 3	6,824 0 11	158,688 12 5	....	158,688 12 5	....	152 7 6	4 15 6	....	....	157 3 0	158,845 15 5
Export and Import Branch	15,132 4 11	1,223 12 6	1,950 0 0	18,305 17 5	....	18,305 17 5	....	....	12 0 0	....	....	12 0 0	18,317 17 5
Plant Quarantine Service	30,067 11 9	2,055 0 7	....	32,122 12 4	....	32,122 12 4	....	....	....	....	....	....	32,122 12 4
Division of Dairying—													
General	83,369 0 8	15,923 1 1	100 0 0	99,392 1 9	....	99,392 1 9	....	222 14 3	....	....	....	222 14 3	99,614 16 0
Herd Recording	87,884 12 2	24,665 7 6	914 0 3	113,463 19 11	....	113,463 19 11	....	....	....	....	....	....	113,463 19 11
Hawkesbury Agricultural College	150,601 14 7	78,437 17 4	16,185 18 5	245,225 10 4	18,208 5 1	263,433 15 5	....	860 12 6	3,352 14 9	....	....	4,213 7 3	267,647 2 8
Wagga Agricultural College	72,602 1 0	38,880 6 3	8,964 11 3	120,446 18 6	25,802 5 1	146,249 3 7	....	382 12 11	1,274 0 0	....	....	1,656 12 11	147,905 16 6
Experiment Farms and Stations Branch	....	3 0 0	121 12 0	124 12 0	....	124 12 0	....	....	....	....	....	....	124 12 0
Alstonville Tropical Fruit Research Station	5,112 10 5	4,109 18 2	638 12 0	9,861 0 7	7,617 2 4	17,478 2 11	....	....	1 15 0	....	....	1 15 0	11,479 17 11
Bathurst Experiment Farm	16,154 7 11	6,837 16 3	902 8 2	23,894 12 4	....	23,894 12 4	....	24 14 8	393 2 0	....	....	417 16 8	24,312 9 0
Condobolin Experiment Farm	13,117 18 11	8,177 6 9	4,016 12 2	25,311 17 10	....	25,311 17 10	....	76 12 10	....	....	....	76 12 10	25,388 10 8
Cowra Experiment Farm	9,627 2 0	3,222 17 11	3,404 9 5	16,254 9 4	....	16,254 9 4	....	10 8 3	59 8 0	....	....	69 16 3	16,324 5 7
Grafton Experiment Farm	30,590 9 1	8,817 7 7	361 9 10	39,769 6 6	581 0 0	40,350 6 6	....	23 12 7	....	....	....	23 12 7	40,373 19 1
Griffith Viticultural Nursery	2,255 1 9	7,350 16 10	2,137 13 5	11,743 12 0	....	11,743 12 0	....	....	5 4 0	....	....	5 4 0	11,748 16 0
Leeton Experiment Farm	19,062 4 10	10,945 4 10	2,396 2 8	32,403 12 4	....	32,403 12 4	....	50 3 7	428 6 0	....	....	478 9 7	32,882 1 11
Lower Murray Research Station	3,116 15 10	2,469 16 4	144 1 5	5,730 13 7	5,513 4 1	11,243 17 8	....	....	222 10 0	....	....	222 10 0	11,466 7 8
Narara Citrus Experiment Station (*a*)	16,329 16 7	3,519 0 1	338 5 5	20,187 2 1	829 4 8	21,016 6 9	....	9 7 10	....	....	....	9 7 10	21,025 14 7
Narrabri Experiment Farm	7,322 13 0	3,106 19 8	529 12 8	10,959 5 4	6,501 8 7	17,460 13 11	....	91 10 8	....	....	....	91 10 8	17,552 4 7
New England Agricultural Research Station	21,955 6 3	7,112 2 7	1,702 5 10	30,769 14 8	294 10 1	31,064 4 9	....	60 8 0	....	....	....	60 8 0	31,124 12 9
Seven Hills Poultry Research Station	17,923 19 2	6,964 10 7	608 6 3	25,496 16 0	7,888 4 6	33,385 0 6	....	57 3 9	125 13 9	....	....	182 17 6	33,567 18 0
Tamworth Agricultural Research Station	7,941 16 4	7,246 18 11	1,118 1 10	16,306 17 1	28,138 0 0	44,444 17 1	....	44 9 2	....	....	....	44 9 2	44,489 6 3
Temora Experiment Farm	13,712 19 5	4,984 17 5	1,039 12 0	19,737 8 10	....	19,737 8 10	....	29 17 10	107 15 9	....	....	137 13 7	19,875 2 5
Trangie Agricultural Research Station	23,391 6 0	15,329 11 0	2,100 10 10	40,821 7 10	5,913 0 2	46,734 8 0	....	101 9 8	....	....	....	101 9 8	46,835 17 8
Wollongbar Agricultural Research Station	16,311 1 11	10,221 0 2	528 6 9	27,060 8 10	....	27,060 8 10	....	37 13 0	18 0 0	....	....	55 13 0	27,116 1 10
Yanco Agricultural Research Station	42,454 0 7	18,213 1 1	5,794 19 7	66,462 1 3	10,918 4 11	77,380 6 2	....	74 7 1	489 9 0	....	....	563 16 1	77,944 2 3
Tobacco Research	....	....	2,250 0 0	2,250 0 0	....	2,250 0 0	....	....	....	....	....	....	2,250 0 0
Division of Animal Industry—													
Head and District Offices	179,142 14 10	33,551 18 2	5,295 16 3	217,990 9 3	....	217,990 9 3	....	1,925 0 4	255 12 9	....	....	2,180 13 1	220,171 2 4
Glenfield Veterinary Research Station	54,861 2 11	11,804 18 5	1,740 3 9	68,406 5 1	....	68,406 5 1	....	....	....	....	....	....	68,406 5 1
Meat Inspection Service—													
Homebush	83,530 2 1	2,036 3 9	....	85,566 5 10	....	85,566 5 10	....	....	....	....	....	....	85,566 5 10
Other Abattoir	134,660 6 6	15,803 12 4	....	150,463 18 10	....	150,463 18 10	....	....	....	....	....	....	150,463 18 10
Knackeries	2,013 0 5	706 7 3	....	2,719 7 8	....	2,719 7 8	....	....	....	....	....	....	2,719 7 8
Animal Quarantine Service	14,643 18 11	983 7 4	....	15,627 6 3	....	15,627 6 3	....	....	....	....	....	....	15,627 6 3
Queensland Border	59,735 14 3	16,206 1 5	9,828 6 3	85,770 1 11	....	85,770 1 11	....	....	....	....	....	....	85,770 1 11
Tick Quarantine Areas	591,440 5 10	311,319 6 1	38,392 15 4	941,152 7 3	....	941,152 7 3	....	....	....	....	....	....	941,152 7 3
Royal Botanic Gardens and Allied Activities	116,138 18 0	7,461 2 7	8,263 14 0	131,863 14 7	....	131,863 14 7	....	707 4 8	436 11 0	....	....	1,143 15 8	133,007 10 3
Totals £	2,954,733 12 0	854,077 7 7	214,526 13 3	4,023,337 12 10	118,204 9 6	4,141,542 2 4	69,057 13 9	41,119 13 5	7,186 17 6	67,426 15 1	191,169 12 5	375,960 12 2	4,517,502 14 6

(*a*) Previously Gosford Citrus Research Station.

(1) Being Expenditure on—

	£ s. d.
Stores, Stationery, Furniture, etc.	38,831 1 4
Cleaning Services	30,226 12 5
	£69,057 13 9

(2) Being Expenditure on—

	£ s. d.
Gas and Electricity	23,260 17 8
Maintenance of Buildings	18,716 17 9
Telephones	25,448 19 8
	£67,426 15 1

APPENDIX II

Published Matter*, 1960-61

*Viz.:—Matter printed as Department of Agriculture (D. of A.) booklets, or contributed to and printed as articles either in Department of Agriculture journals (the monthly *Agricultural Gazette of N.S.W.*, the quarterly *Review of Marketing and Agricultural Economics*, bi-monthly *Dairy Topics*) or the journals of other institutions/organisations; and papers presented to technical conferences

The Appendix does not list numerically the many times greater volume of items contributed, in the course of extension work, to media such as the Department's weekly printed broadsheet, *Press Copy*, or in regional/district publicity releases for newspapers and radio stations. Indications of the volume of this published matter are included in this report under " Division of Information Services—Editorial Section, and Radio Section " and " Regional Extension Services—Regional Publicity ".

A. DIVISION OF PLANT INDUSTRY

D. of A. Booklets

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Jessup, R. J.—College Pride—new variety of French Bean. Agric. Gaz. N.S.W. 71 (9): 499.

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